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# PC WORLD

DECEMBER 1991 $3.95

FOURTH ANNUAL SPECIAL ISSUE

# HARDWARE BUYERS GUIDE

## Over 250 Hot Products!

24 BIG-SCREEN MONITORS

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22 POSTSCRIPT PRINTERS

42 100MB HARD DISKS

14 TAPE BACKUPS

AND MORE!

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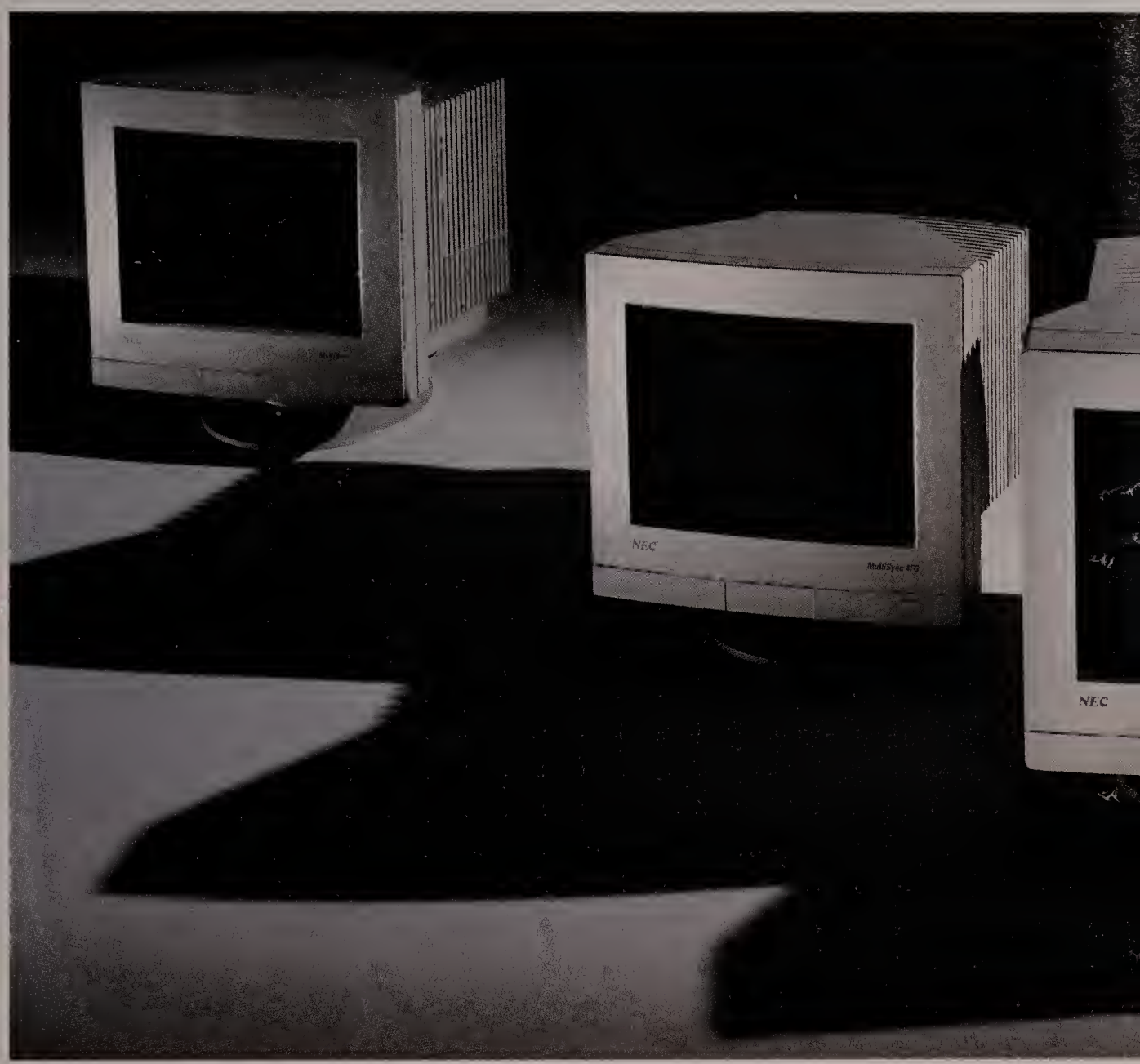


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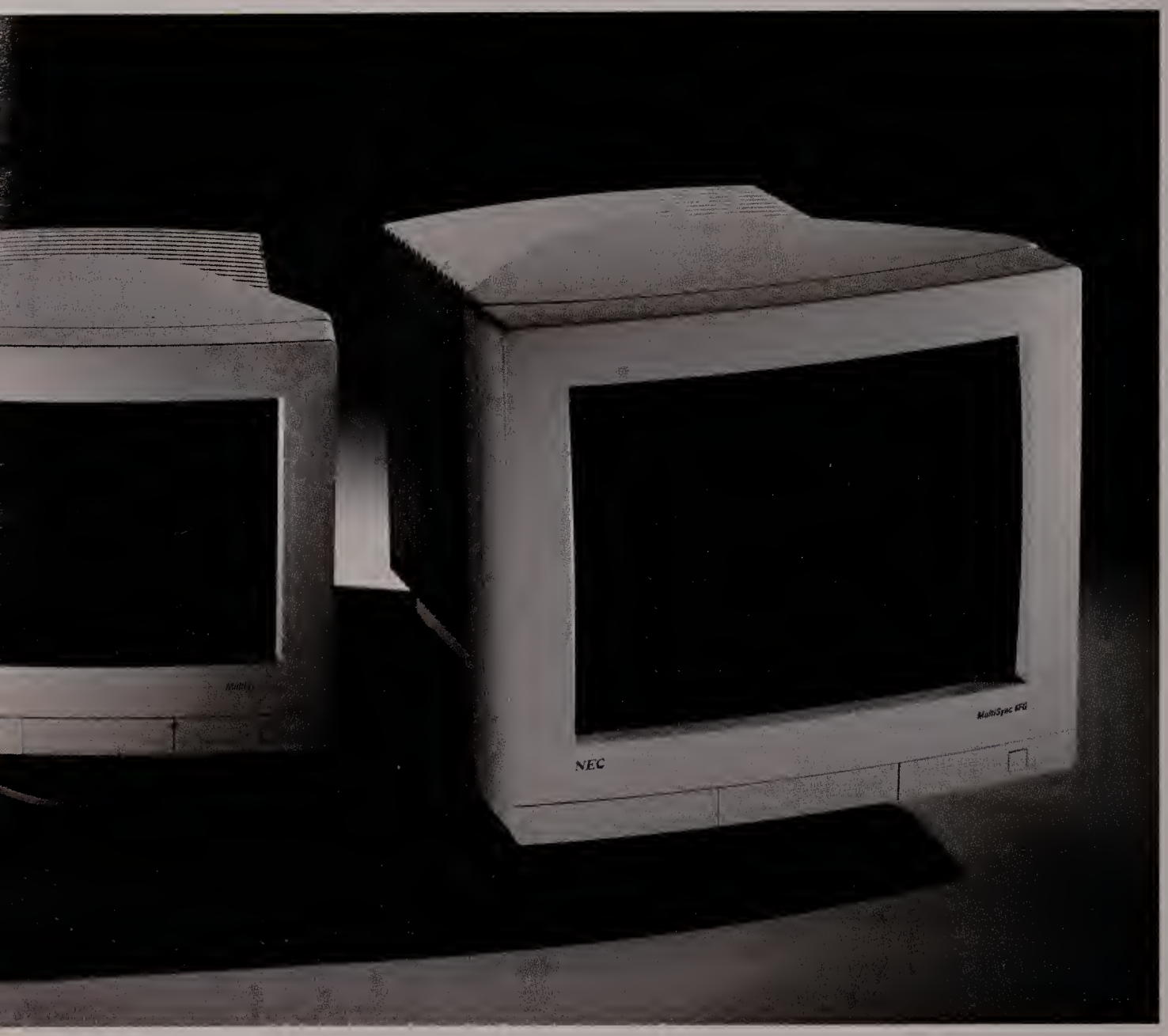


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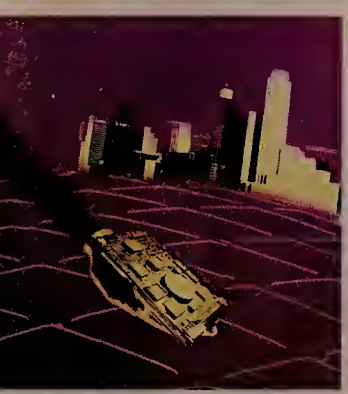

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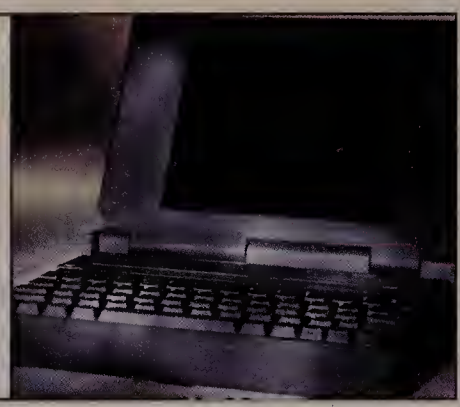

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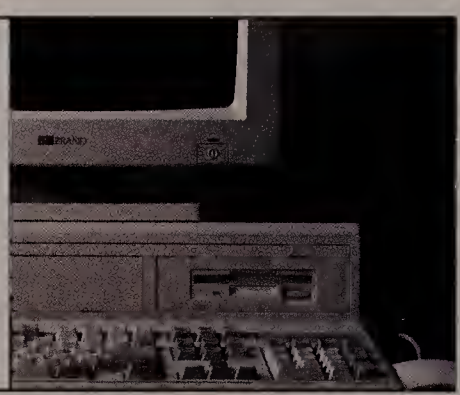

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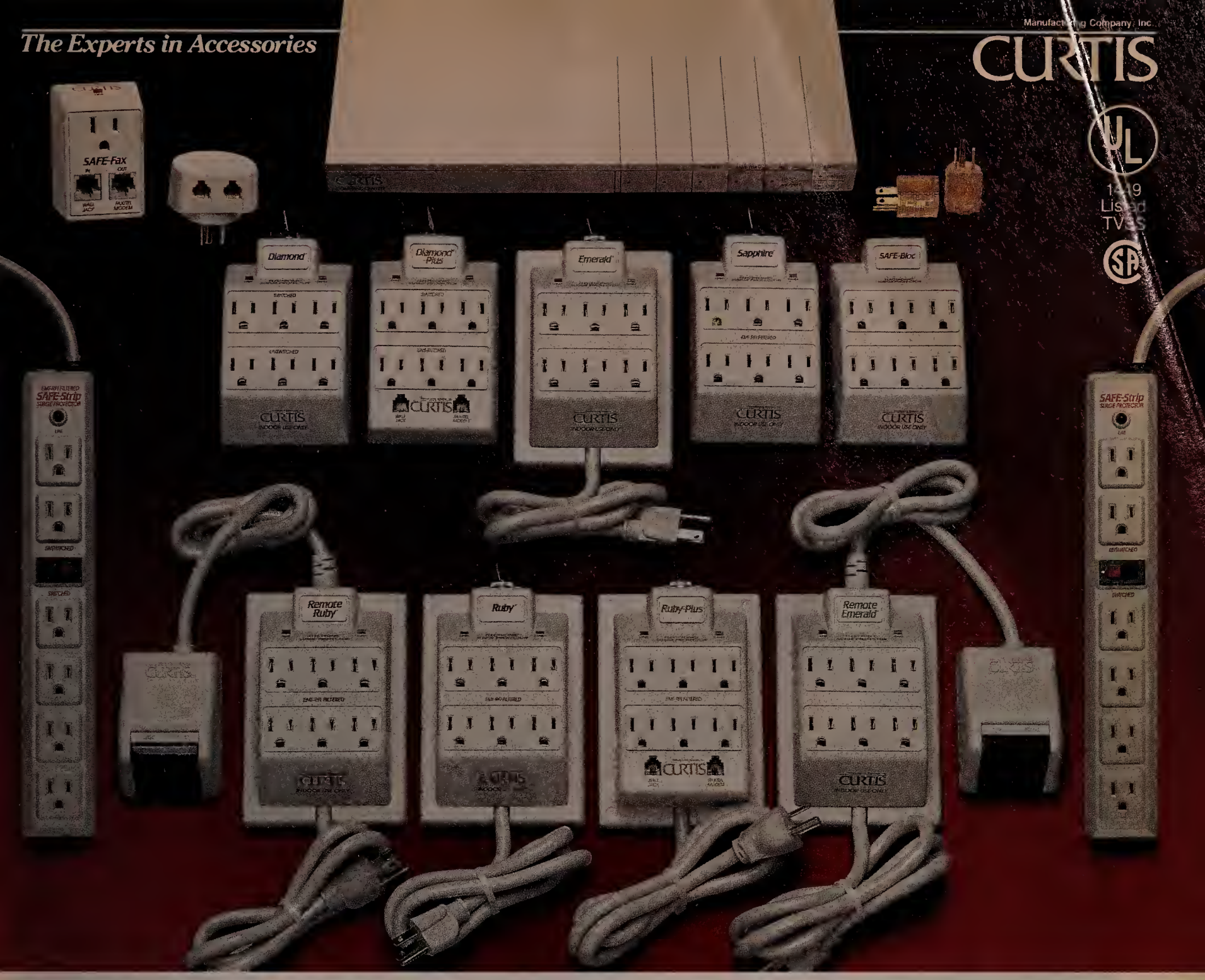


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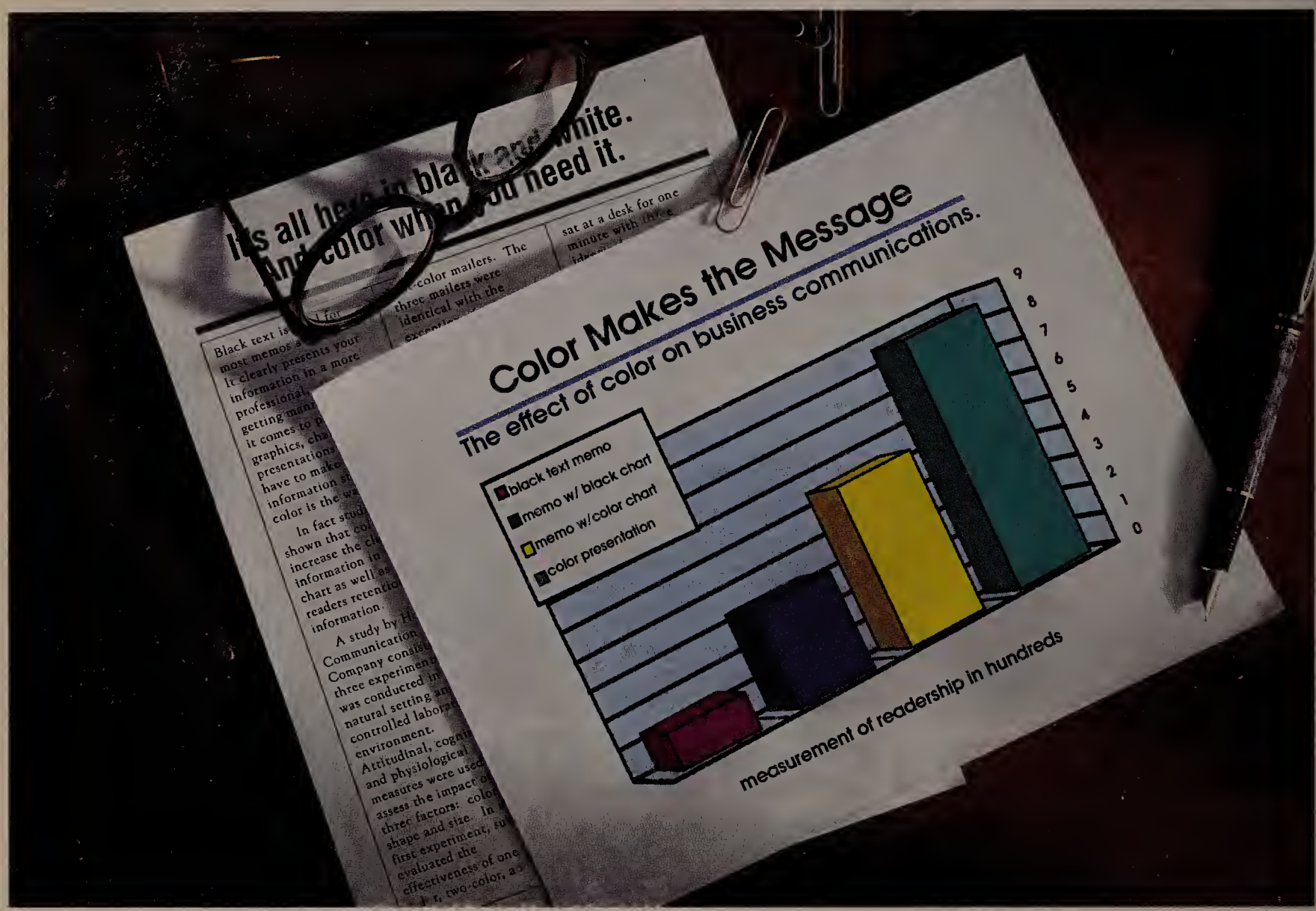


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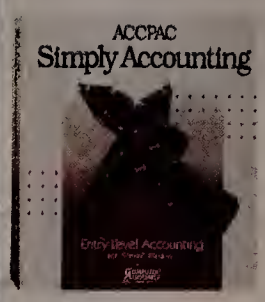


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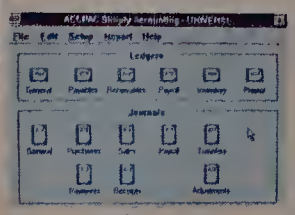

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**Circle 29 on reader service card**

The review crew (from left); Silvius, Tynan, Spector, Farrance, Goodwin, Riofrio, Brown, and Hamilton get into the act as the set is prepared.

ROBERT CARDIN

# Teaming Up for Better Coverage

I want to use my first opportunity to write this column to introduce some staff members and outline some of the ways they are enhancing *PC World*'s product coverage. This special hardware issue provides the perfect occasion to announce that we're opening our arms to far more products than ever. Many staff members have contributed to this process, including Mike Goodwin, Daniel Tynan, Lincoln Spector, Rex Farrance, Melissa Riofrio, and Anita Hamilton. They received major assistance from Technical Editor Karl Koessel and Assistant Technical Editor Susan Silvius.

Our goal for the 486SX roundup in this issue was 25 systems. Our appetite proved larger than the number of available shipping 486SX systems, but we did get and test 11, show features and contact information on 18 more, and throw in coverage of nine leading 33-MHz 386DX systems, one 25-MHz 486DX, and one 40-MHz 386. The result is a battle of performance and value. (We'll shoot for 25 systems in the review of 386SXs coming in our January issue.)

But we're doing much more than broadening our coverage. Senior Editor Eric Brown has spearheaded an approach to reviews that combines new rigor in performance and value analysis with unprecedented clarity and conciseness in presenting conclusions for the busy management reader. We've added to *our* work load in order to lighten *yours*.

The review process builds a mountain of information, then compresses it into a compact but accessible format. System reviews take into account performance, price, expandability, service and support, fast-RAM capacity, and design and construction. Performance measurements come from an exhaustive suite of application-based benchmarks. Prices used in calculations come from a large telephone survey of street prices. Further telephone calls put vendor service and support to the test. Then each of the six major factors are weighted to reflect the concerns of the majority of our readers, and the systems are ranked accordingly.

For your convenience, editors pack this hard-won information into a capsule format. An "Executive Summary" highlights major conclusions. "Buying Smart" concisely explains the major issues in making a purchase. A "Best of the Rest" sidebar gives information on similar products that didn't arrive in time to be tested. If your priorities differ from those used in the review, you can change our weightings and use a spreadsheet to recalculate and rank the systems anew.

These improvements are but a first step. Look for further expansion of our product coverage in future issues. Those of you who buy through the direct channel can look forward to expanded coverage of direct-marketed machines. New-product coverage in *Product Outlook* will expand starting in the January issue. Blockbuster products will get full feature treatment starting in February. Our reviews will visit many major product categories twice in 1992 rather than once.

In short, *PC World* is rededicating itself to both parts of its mission: To provide the most useful and accessible information to the busy management reader, and to provide a level playing field for products that can benefit this reader, whether they come from industry giants or ambitious newcomers.

*Phil Lemmons*
*Editor in Chief*

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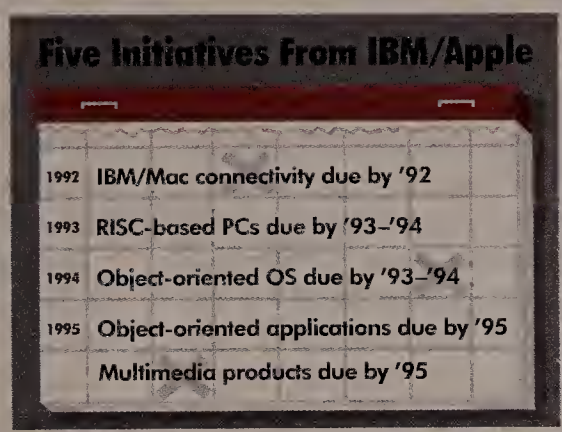
**Circle 46 on reader service card**

Edited by RUSSELL GLITMAN

# IBM, Apple Close Ranks

*Microsoft Is Target, OS/2 May Be Victim*

IBM and Apple have united in a bid to wrest control of the computer industry from Microsoft, but users say the alliance will have little impact on buying plans and may hamper IBM's efforts to present OS/2 as a *Windows* alternative.




Apple and IBM plan an array of system software and multimedia introductions over the next four years.

The two giant manufacturers banded together in October with the promise of an object-oriented operating system running on RISC-based PCs. More immediately, the partners plan to expand Macintosh connectivity into Big Blue corporate shops. Most of the initiatives, including multimedia and object-oriented applications, are unlikely to see shrink-wrap until 1995.

That distant horizon has most users eyeing developments but buying *Windows*. "I don't see the alliance having much impact for years to come," says Sanford Rosen, program director for the Columbus (Ohio) Computer Society. "The PC environment has splintered from IBM. [IBM doesn't] control the market."

Regaining control is the goal. First, IBM and Apple hope to counter Microsoft's growing power over application development and the direction of operating system software. Second, by developing with Motorola a new RISC-based platform, they hope to differentiate their hardware from the growing ranks of clones.

The first victim of the pact may be OS/2, and IBM says version 2.0 won't ship until early 1992. "I would interpret this as a signal that one should not go to OS/2 because it will be very transitional," says Jordan Rosenberg, president of PC Window, a San Francisco consulting firm.

In fact, even while Jim Manzi, chairman of Microsoft archrival Lotus Development, publicly endorsed the alliance, he offered this advice for today's application software shoppers: "Buy *Windows*."

# IBM Abandons Application Push

Just as IBM Desktop Software prepared to launch its most likely hit product, its parent pulled the plug on the PC application group.

The move leaves *Signature* (a DOS successor to *DisplayWrite* that's completed but has not shipped), the *Hollywood* presentation graphics package, the *Platinum* accounting line, and other packages looking for new homes at press time. Some may go back to the developer, others to different IBM groups.

Rather than developing and marketing applications, IDS will concentrate on forging alliances with major software vendors and on creating platforms such as *OfficeVision*, an office software suite whose PC LAN version has been delayed for years.

IDS was formed late in 1988 to acquire applications. "What we bring to the table [with vendors] is a focused and dedicated sales forces, dollars, and access to channels and large accounts," said General Manager Fernand Sarrat at that time. However, established software firms were put off by IBM's insistence on exclusive marketing rights "given its remarkable track record of failure," notes Infocorp analyst Bill Higgs.

While most of its titles sold reasonably well, and it was marginally profitable, IDS never enjoyed a major hit. Its greatest opportunity lay in word processing, because *DisplayWrite* is still among the top five packages in installed base. IBM teamed with XyQuest to produce *Signature*, which offers editable WYSIWYG fonts without *Windows*—a unique capability. But development delays made *Signature* late to market. By that time, says Higgs, IDS had been caught up in chairman John Akers's general unhappiness with IBM's performance and became "an object lesson in what happens when you don't meet the goals."

# 386SL Notebooks Pick Up Steam

Intel made good its promise to extend the reach of the 386SL by introducing a 25-MHz version of the power-saving notebook chip just prior to COMDEX Fall. Meanwhile, the COMDEX floor showed the popularity of the 20-MHz version of the CPU: More than three dozen 20-MHz SL notebooks debuted, one of the more striking a color notebook by Sharp Electronics.

Although Sharp is a prime supplier of active-matrix color LCDs, the PC-6881 is its first truly remarkable notebook. It has the traditional 8½-by-11-inch notebook footprint and—thanks to Sharp's second-generation active-matrix LCD technology—a height of only 1.9 inches. The unit is smaller and slimmer than the AST Research and Epson America color notebooks.

The new technology in the 8.4-inch diagonal VGA display is one-third the width of Sharp's first-generation active-matrix display and takes one-third less power. Battery tests to determine how well the low power display helps the machine meet the power requirements of color were not available at press time, but the PC-6881 appears promising in that regard.

For one thing, it's the first 386SL notebook that turns the power down between keystrokes, thanks to the new Phoenix Technologies PowerMiser BIOS. The machine uses nickel-cadmium batteries, but an optional battery pack attaches to the back and doubles available power.

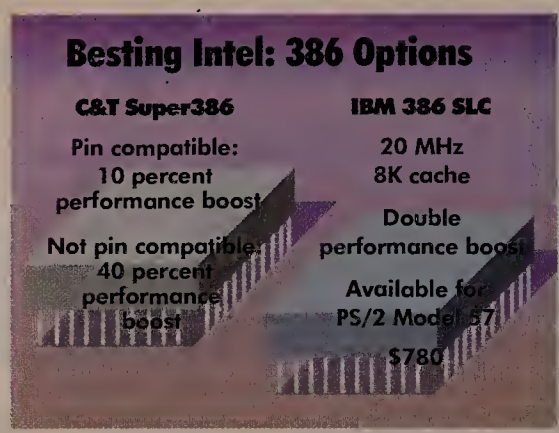
The PC-6881 also has the characteristic ability of 386SL notebooks to suspend operation for days and return to the exact point of departure, even in *Windows* applications.

Finally, there's the 386SL chip itself. The 25-MHz version draws only 2 percent more power than the 20-MHz version.

GORDON STUDER

# IBM, C&T Show 386 Chips

IBM and Chips and Technologies have joined Advanced Micro Devices in challenging Intel with 386-compatible chips that offer PC purchasers more bang for the buck.




C&T and IBM have developed powerful alternatives to Intel's 386DX and 386SX microprocessors.

IBM claims that its 20-MHz 386 SLC, which incorporates an 8K on-chip cache and optimized instructions, offers twice the performance of Intel's equivalent 20-MHz 386SX. The SLC will appear by year-end in a $780 board upgrade for the PS/2 Model 57, reportedly boosting application speed as much as 88 percent. Next year the technology will be incorporated in as-yet unannounced IBM desktops and portables. Unlike other chip makers, IBM has a licensing agreement with Intel that gives it indisputable rights to market the chip. IBM has no plans to sell the chip to other PC suppliers.

Chips and Technologies's new Super386 line comes in two flavors: pin-compatible SX and DX chips that provide a 10 percent speed boost over their Intel counterparts, and SX and DX compatibles that require special sockets and yield a 40 percent improvement. Arriving early next year, the Super386s offer PC suppliers new ways to conserve power, solve software-incompatibility problems, and differentiate their systems. Most PC suppliers had hesitated to move away from Intel until recently, "but the cracks are appearing in the wall," declares C&T president Gordon Campbell.

Intel lacks anything like C&T's new PC/Chip, which combines an extremely fast 8086 compatible with system logic, graphics adapter, serial port, and power-management features on a single piece of silicon. By early next year, PC/Chip will appear in a wave of very powerful DOS palmtops that can run for many hours on standard batteries and are also very cheap—priced at $500 or less.

Meanwhile AMD, which began shipping its 386 CPUs last spring, says it should deliver a million of them by year-end. Nexgen, Cyrix, and other suppliers are expected to enter the arena in 1992.

## Giving More Life to Batteries

Notebooks capable of 6 or more hours of uninterrupted battery-powered computing could be available by second-quarter 1992, with 9 to 11 hours possible by year-end.

Advanced Micro Devices has become the first to introduce 386 SX and DX CPUs capable of 25-MHz and 33-MHz clock speeds using low-power 3.3-volt circuitry. AMD's new AM386SXLV and AM386DXLV conserve 56 percent more power than their 5-volt predecessors, which AMD claims already get 5½ and 4½ hours of uninterrupted operation, respectively.

But those are lab results, not field results, notes AST Research marketing director Marcy Puhnaty. AST's Premium Exec 386SX/25 bests comparable Intel 386SX and 386SL notebooks thanks to AMD's 25-MHz AM386-SXL-25 chip but falls about an hour short of AMD's 5½-hour claim, says Puhnaty.

Still, she agrees that 6 to 6½ hours of battery life can be achieved at least by second quarter. By then, enough complementary 3.3-volt components will have been introduced to produce mixed-voltage systems.

The "all-day" notebooks capable of 9 to 11 hours of battery operation will be here by year-end 1992 when every component is operating at 3.3 volts, maintains AMD marketing manager Rajeesh Tanna.

These developments are not unique to AMD processors. Intel will release 3.3-volt chips of its own, says Dave Ryan, the company's 386SL marketing manager, who agrees that 6-hour notebooks will be here by midyear. But not all vendors will use the extra power for longer operation, adds Dean McCarron of Instat. Some will trade the extended hours for color screens, lightweight pen-based systems, or even the use of alkaline batteries.

GORDON STUDER

## Computer Associates Prefers Windows

The world's second-largest software company, Computer Associates, has thrown its weight behind *Windows*. Again.

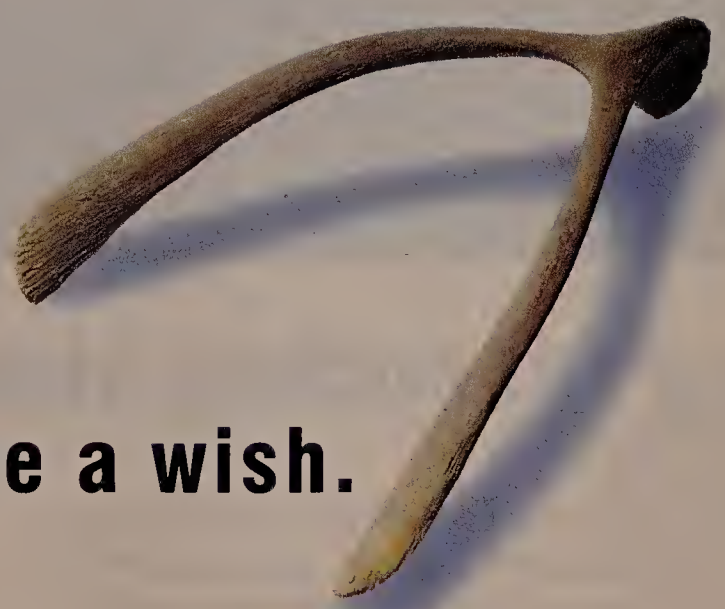
Although CA has tried unsuccessfully in the past to crack the *Windows* market, this time Chairman Charles Wang is managing the assault directly and promises to integrate CA's mainframe and midrange software with its upcoming *Windows* products. This approach will give users not only more *Windows* applications to pick from but applications geared for distributed processing and client-server computing.

"You tend to get better when you fail the first time," Wang says. As proof of lessons learned, he points to several products introduced in October. These include an *xBASE* development language and data base product, *dBFast;* an image processing system, *CA-PHIPS;* and a *Windows* version of CA's *SuperProject* project management application. A word processor, a personal information manager, and a *Windows* version of *SuperCalc* were expected to be unveiled at COMDEX.

While not all the products are available yet, the array of *Windows* offerings will be formidable. To get the products out the door, CA is retraining mainframe and midrange programmers to develop for *Windows.* To exercise tighter control, it has moved the headquarters of its PC business unit to the corporate office.

Although CA's PC software revenue was only $150 million to $200 million on $1.35 billion total revenues in the fiscal year ended March 31, 1991, the renewed commitment to *Windows* is particularly significant because CA is the largest vendor of mainframe software. Its sales force has direct entrée to corporate accounts where IBM is trying to promote OS/2. With CA banging on the doors with *Windows* applications, IBM's OS/2 sales mission just got tougher.

According to Wang, CA's primary reason for developing *Windows* is economic. "Very few of our customers were asking for OS/2 PM applications," he says.



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# LETTERS

Reactions and responses from the PC World community

ROBERT KOPECKY

### IBM and Apple: A Stand-Up Team?

I enjoyed your September *Top of the News* item on the IBM/Apple joint operating system venture ["New OS Plan Unfolds"]. I used to think of IBM as dull and humorless, but this collaboration is really good for a laugh. IBM's and Apple's predictions of one operating system running on PCs, Macs, and workstations elicited a chortle. But they had me rolling on the floor with their promise to run DOS, *Windows*, OS/2, and Mac applications under one OS. IBM and Apple have obviously teamed up as the Laurel and Hardy of the personal computer industry.

*R. T. Brown*
*Los Angeles, California*

ANTHONY RUSSO

### Disposable PCs

I find Alan Kaplan's PC purchasing logic bizarre, to say the least. Did I hear him right? Did he really say that it makes more sense to buy two clones than one IBM, "so if one clone burns up, you can throw it out the window and you'll still be ahead" [*In This Issue*, September]. Would he buy four Yugos, then, instead of one Volvo? If so, I hope he's not in front of me when one of them expires in rush-hour traffic. I want reliability from my vendor and my equipment, not sudden death. What am I supposed to do about files that perish with the computer? I can't risk losing work, so I avoid disposable PCs.

*Irwin Schorr*
*Bethesda, Maryland*

*Whoa! Today's popular clones are hardly Yugos (see* Rate Your Satisfaction *in this issue), and reliability by redundancy is a simple fact. Also, standardization and modularity permit failed components to be replaced easily (at least in clones), so we're not really talking about throwing out systems. By backing up on the drives of a second complete clone system, you'll certainly increase your uptime, you may increase your mean time to failure, and you may still save money. IBM makes a fine system. So do many clone manufacturers. —Alan Kaplan*

### Software Helps Laptops Steal the Show

Your September issue included a fascinating article by Bronwyn Fryer on how insurance agents use laptops to increase sales ["On Site: Laptops Steal the Show"]. The story mentioned a few software packages: Impact Technologies' *Impact*, *Isis* from Isis, and Vernon Publishing's *FNA*. Could you let us know where to find them?

*Brendon Woirhaye*
*Chino, California*

*You bet! Sorry we didn't mention the vendors' cities so you could track them down on your own. Impact 800/438-6017, Isis 702/358-7400, Vernon 203/643-2200. —Bronwyn Fryer*

### DOS and Windows Programs: A Best Buy for Each?

While I read the September review "Spreadsheets: Beyond Number Crunching," I was struck by the incongruity of rating DOS and *Windows* software side by side. It seems to me that PC users are polarizing into dedicated DOS and *Windows* groups. I'm exclusively in the DOS camp, and I'm just not interested in buying *Windows* packages. So I think that instead of awarding a single Best Buy to a *Windows* product like *Excel 3.0*, you should award a character-based Best Buy too.

*Harwood Loomis*
*Woodbridge, Connecticut*

### Better Peripherals Sharing

I enjoyed Rex Farrance's "Share Peripherals Without Networking" in the September issue, but I was sorry that you didn't acknowledge the frequent need for spooling software on local workstations. You install a spooler, like our *PrintQ* (or even a public domain spooler), on individual PCs, and it spools the job to your local hard disk first. So if large graphics files have already filled up the shared buffer, your computer won't hang while it waits to print.

*Alex Czajkowski*
*Software Directions*
*Randolph, New Jersey*

**Modem Communications Problem**

I always find your Buyers' Guides informative and helpful, but I think you missed the mark in September ["Buyers' Guide: 2400-Baud Modems"]. That same month, *Product Outlook* covered the $149 SpeedModem Champ from CompuCom. Why didn't you include it in the Buyers' Guide? The Champ goes beyond 2400-baud capabilities to allow 9600-baud transmissions (although only with other SpeedModem Champs). I recently bought one, and it's like having a 9600-baud modem for a price that's less than what you have to pay for most 2400s.

*Thomas R. Oertel*
*West Allis, Wisconsin*

*Even though all 9600-baud modems are capable of 2400-baud transfers, we couldn't include them in our Buyers' Guide to 2400-baud modems. Most 9600-baud modems are priced much higher than 2400-baud modems and include V.32 compatibility, which allows 9600-baud transmission with compatible modems. Although the SpeedModem Champ's price is comparable to that of 2400-baud modems, it can perform 9600-baud transfers only with another Champ. But the Champ's low price makes it attractive to many prospective buyers of 2400-baud modems. —Ed.*

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Your September preview of NCR's 3125 Notepad gives an exciting glimpse into the future of pen-based computing


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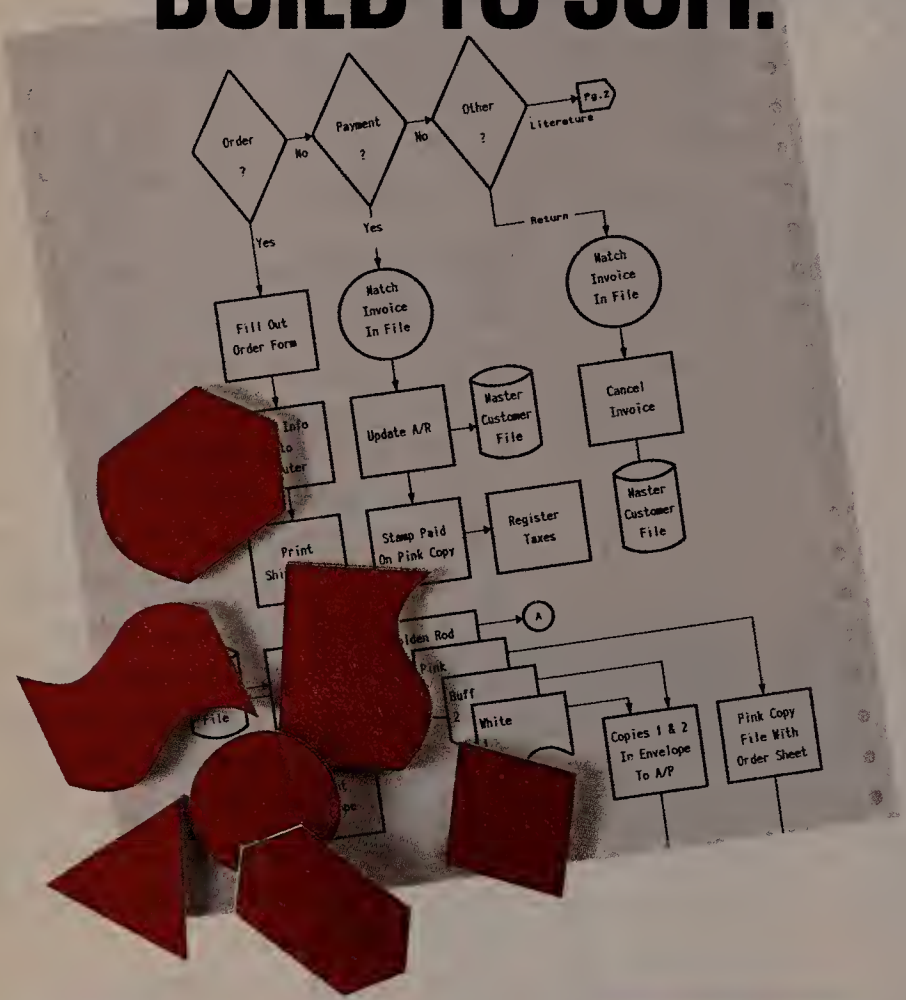


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**POWER TIP NO. 226**

**Time/Date Prompt**

If you haven't invested in a snazzy graphical user interface and you spend a lot of time staring at a DOS prompt, you might find it convenient to have the day, date, and time posted on your screen. To do so, insert the following line in your AUTOEXEC.BAT file:

```
prompt $e[s $e[01;50H $d $t $e[u
$p$g
```

Be sure to include the line **DEVICE=C:\DOS\ANSI.SYS** in your system's CONFIG.SYS file.

Also remember that the time shown doesn't change automatically; press <Enter> at the DOS prompt to see the current time.

*Jayesh S. Thakrar*
*Computers and Telecoms Systems Ltd.*
*Dar es Salaam, Tanzania*

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- 16 Bit VGA 1Meg RAM
- Parallel/Game/Serial Ports
- Microsoft DOS 5.0
- Windows 3.0 w/ Mouse
- Tower or Desktop Case
- OmniKey/101 KB by Northgate

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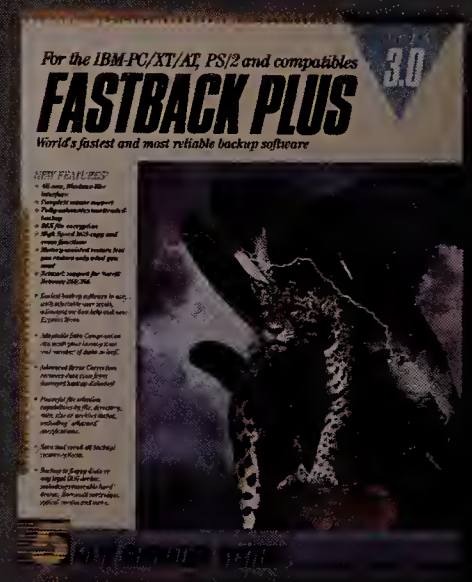
**Circle 189 on reader service card**

# Backup. For people who don't.



Everyone who uses a PC ought to back up regularly. But most people don't back up at all.

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Guess what?

Now it can.

Now you can set up fully automatic, unattended backups for every PC in the house.

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And transform a simple, effective backup policy from fantasy into fact.

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The latest version of the world's most popular backup software comes complete with a backup policy of its own — in the form of pre-designed scheduling templates — that you can adapt with our unique Macro Editor.

What makes our Macro Editor unique?

It uses plain English commands. Which means you can actually use it.

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If there are a couple of kinds of computers in your workplace, you'll want to know that using Fastback Plus on PCs is very much like using Fastback Plus for the Macintosh® — same look, same functionality.

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That's right. You can actually restore a Mac file directly onto a PC, and vice versa.

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And nobody else comes close to our level of reliability.

You can destroy as much as 11% of the data on a diskette and Fastback Plus will recover every last byte, error-free.

Unbelievable?

That's what the people at *InfoWorld* thought.

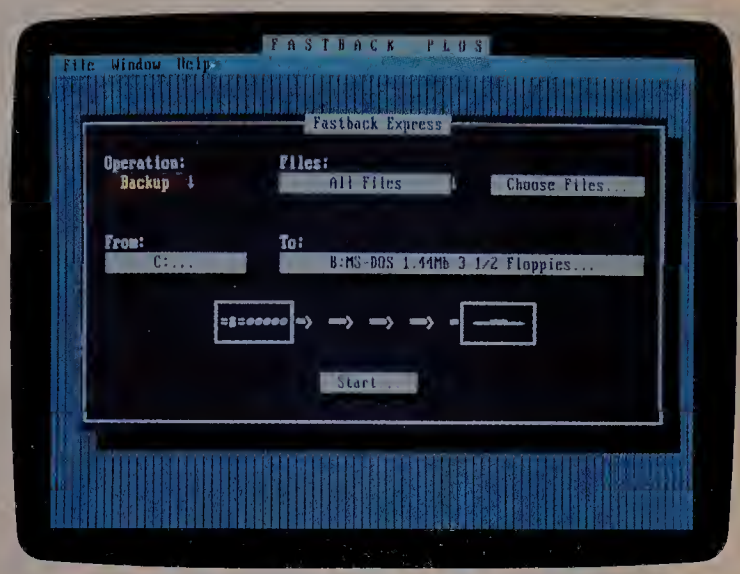
So they "scratched both disks with the point of a knife to simulate accidental damage" and found, to their astonishment, that Fastback Plus "was 100% successful at restoring all the [damaged] files."

Still unsatisfied, they "ran the test several more times, increasing the severity of damage until we began to fear for our disk drives, but we were unable to generate a single byte of unrecoverable data."

We wouldn't recommend trying this test yourself. But if you insist, you'll be glad to know that Fastback Plus is backed up by our vaunted 24-hour toll-free technical support and a one-year money-back guarantee.

There's more. So pick up the phone. Dial 1-800-388-0362.

And tell everyone to stand back.




*If automated, unattended backups aren't your style, you can still enjoy unprecedented convenience with our new Express Menu, which* InfoWorld *considers "only slightly more complicated than an on/off switch."*

**FIFTH GENERATION SYSTEMS, INC**

**Circle 71 on reader service card**

["NCR Gestures to the Future"]. TelePad, a small company from Reston, Virginia, is making the future even brighter. Its TelePad SL, which should be available early next year, is a modular 386SL. It will be made according to customer specifications and will feature up to 8 MB of RAM and a hard disk as large as 120MB. You'll be able to order a "smartcard"-capable version, and the TelePad should be less expensive than comparable 386SLs.

*Stephen P. Marks*
*Dobbs Ferry, New York*

**A BASIC Complaint**

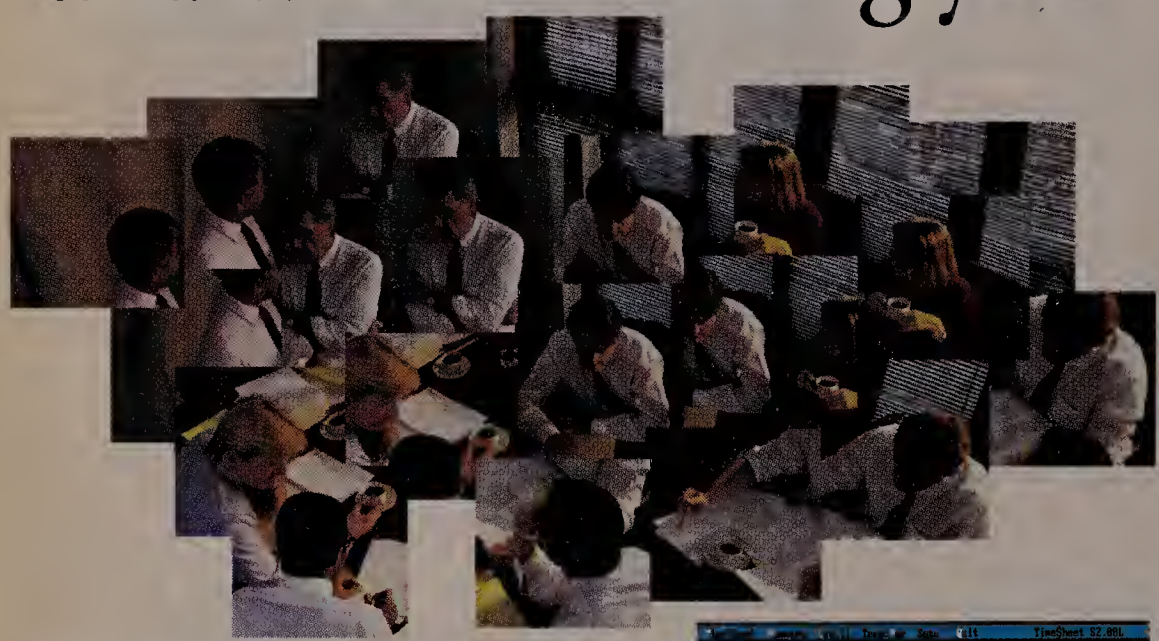
Brett Glass has done the professional programming community a disservice by stating that developers wouldn't want to create a major application using Microsoft's *Visual Basic* [*Developer's Toolbox*, September]. As a professional programmer, I agree that *Visual Basic* is easy to learn and use. Since when is that a liability? Further, it's absurd to say that *Visual Basic* borrows its online keyword help from *Turbo Pascal:* Microsoft introduced that feature with *QuickBASIC 4.0* in 1987. In fact, it was Borland that borrowed from Microsoft.

*Ethan Winer*
*Crescent Software*
*West Redding, Connecticut*

*[Mr. Winer's company, Crescent Software, sells tools and libraries for BASIC programmers. —Ed.]*

*Ease of use is not a liability—I've used* Visual Basic *to create and publish many simple* Windows *utilities. None-*


# Who's doing what, and what's it costing you?



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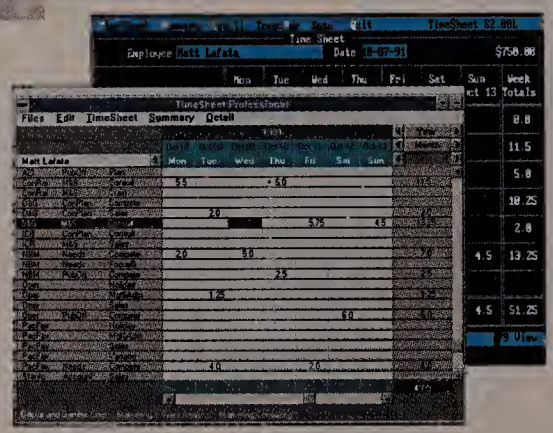

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Circle 28 on reader service card


**POWER TIP NO. 227**

**Using Windows 3.0's System Configuration Editor**

You can set up an icon that will give you quick access to *Windows 3.0's* system configuration files, SYSTEM.INI, WIN.INI, CONFIG.SYS, and AUTOEXEC.BAT. Load Program Manager and select a window for your icon. Then select *File New Program item OK*. Choose *Browse* and navigate through your subdirectories to find and select the \WINDOWS3\SYSTEM subdirectory. Select *sysedit.exe*, type a description for your icon, and select *OK*. You can now select the icon whenever you need access to any of these files.

*Robert Kanes*
*Associate Art Director*

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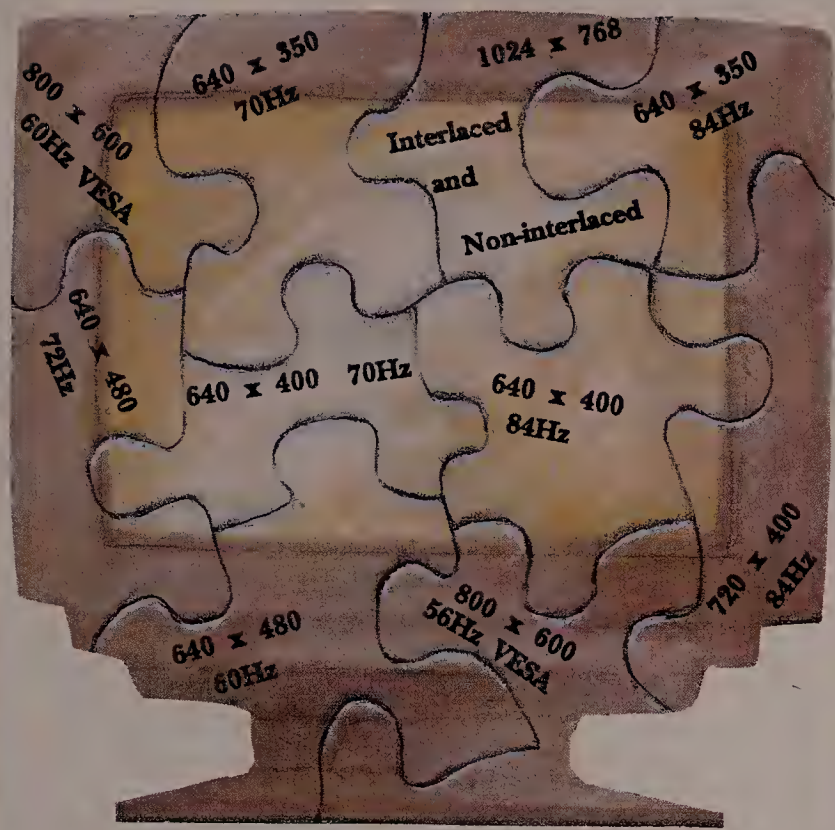

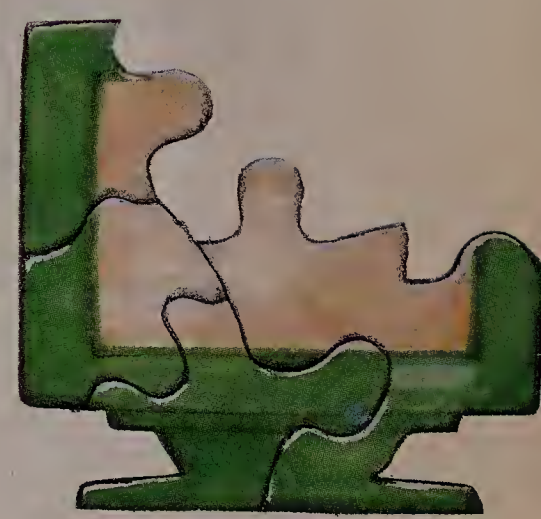

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*theless, I maintain that* Visual Basic *doesn't have what you need for creating major applications. It can't create Dynamic Link Libraries (DLL) or integrate easily with other languages. It lacks true object orientation, requires a large run-time library, and does not work with professional programming tools such as profilers and debuggers. My wording was unfortunate on the issue of who introduced keyword help, although* Turbo Pascal for Windows *was the first to bring keyword help to* Windows 3.0. *Actually, DOS products from both Borland and Microsoft incorporated this feature during 1987. Borland's* Turbo C 1.0 *was first, but it's debatable whether either company borrowed from the other. —Brett Glass*

### Storing Compressed Images

In the August *Help Screen*, you suggest that Betty Chin needs a 600MB hard disk or a removable drive to store 2000 or so 180K image files. What about *Picture Packer*, profiled in *Product Outlook* in the same issue? It can compress images 30-to-1 without noticeable loss of quality. So the 2000 files would take up only 12MB on her *present* 40MB hard disk. I hope Betty reads *Product Outlook*; it could save her a bundle!

*Martin J. Adams*
*Limassol, Cyprus*

### Corrections and Clarifications

In our October article "The Readers' Choice: 1991 World Class Awards," we transposed the names of two tax-planning packages. The correct names are *Andrew Tobias' Tax Cut* by MECA Software (16 percent) and *Personal Tax Edge* by Parsons Technology (11 percent). *PC World* regrets the errors.

The product name for World Class award winner ATI Technologies VGA Wonder+512K was also incorrect in our October "World Class Awards."

We listed incorrect information on the Toshiba T1200XE in the September *PC World Marketplace*. The T1200XE is a 12-MHz computer with a 20MB hard disk.

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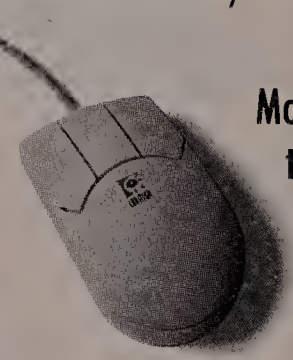

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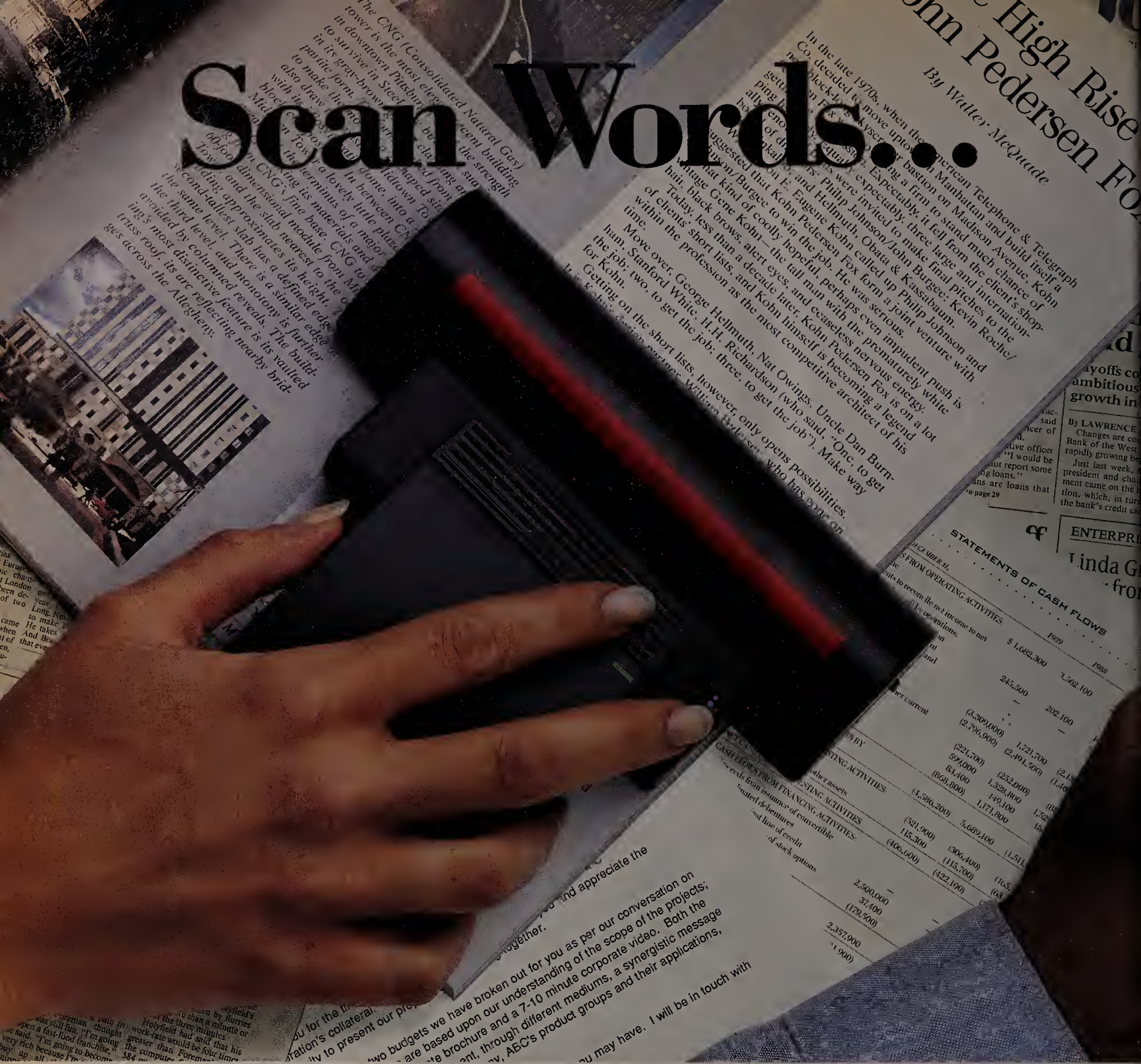


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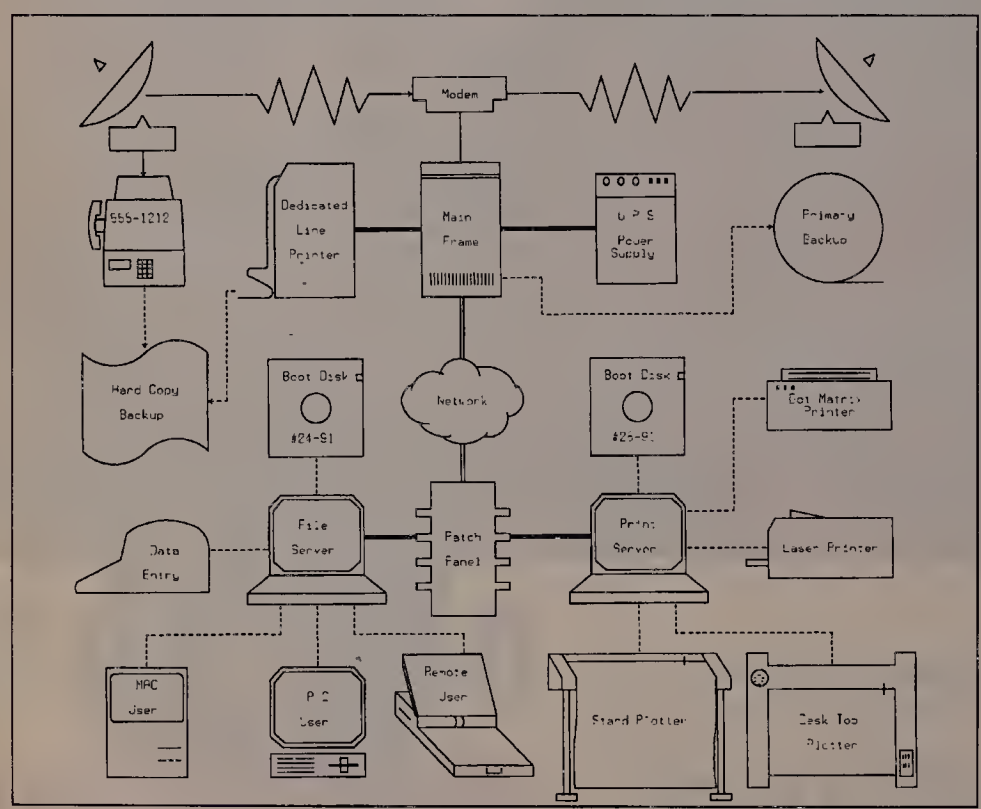


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**Circle 79 on reader service card**



Our October *Product Outlook* profile of *Merge Master*—Stairway Software's new utility that allows you to easily merge *dBASE, Paradox,* and *Clipper* data files with major DOS word processors—erroneously combined the product and company names. You can reach Stairway Software at 800/782-4792 for product information. *PC World* regrets the error.

*Send your reactions, responses, and ideas to* Letters, PC World, *501 Second St. #600, San Francisco, CA 94107; CompuServe 74055,412; MCI Mail PC World Editorial; or 415/442-1891 (fax). Include your name, city and state, and phone number. We reserve the right to edit letters.*

## POWER TIP NO. 228

### Quick Navigation With Magellan

Here's a macro that can help you get around quickly in Lotus's *Magellan*. To create it, press <**F7**>**n**, and type a description, such as **Directory shortcut**. Press <**Cursor Down**> to get to the 'Macro Key' field. Enter the keyword for the key combination you want to use to invoke the macro; for instance, type {**ShftF9**} (don't press <Shift>-<F9>). Then press <**Cursor Down**> to get to the 'Keystrokes' field, and type {**ExPath**}**\ -*.bk! -*.bak {**Home**} {**Right**}{**Right**}. Press <**Enter**> <**Enter**><**Esc**> to save the macro. From then on, pressing <**Shift**>-<**F9**> will bring you to a prompt where you need type only the first few letters of a directory's name to select it.

*Lincoln Spector*
*Assistant Editor*

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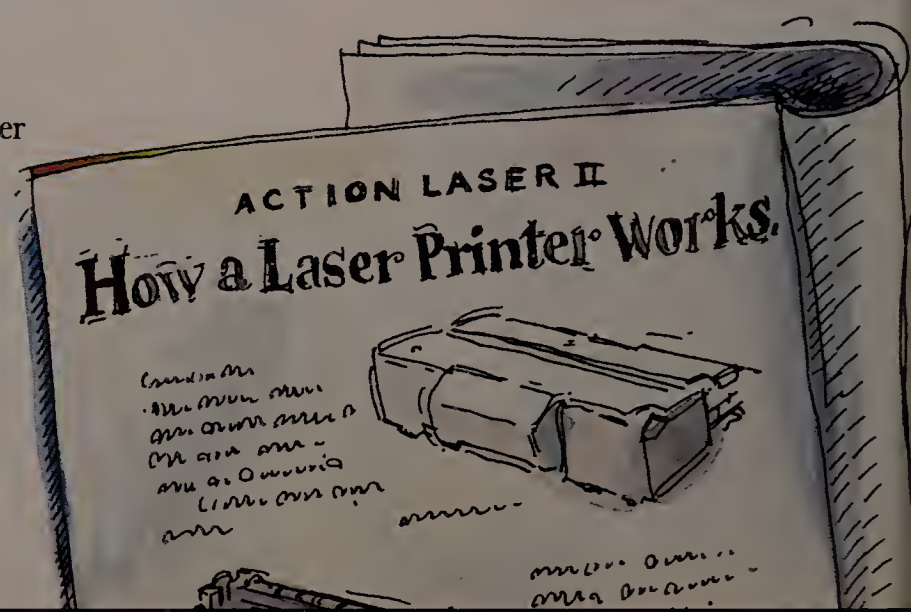


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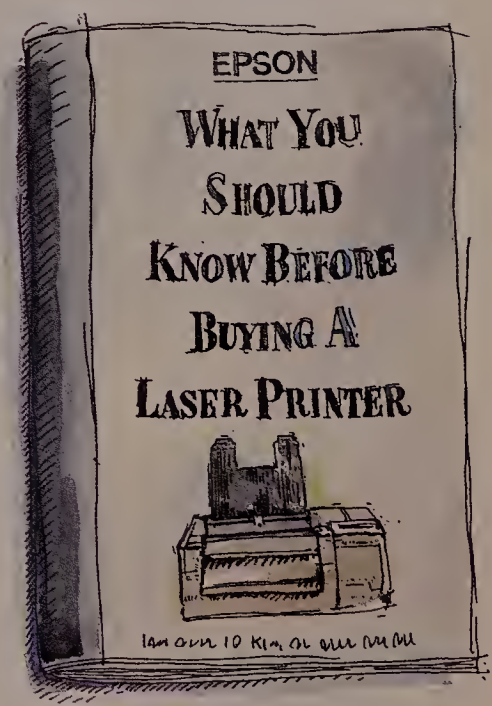


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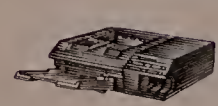
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*Karl Koessel and Robert Lauriston*

### Running Windows With 2MB RAM

**Q.** *I have a 386 with 2MB of RAM. I use mostly* Windows *apps, but I also multitask DOS programs. What CONFIG.SYS entries will make the best use of my extended memory? I'm currently using HIMEM.SYS, SMARTDRV.SYS, and MOUSE.SYS and find I don't always have enough memory for my DOS applications.*

*Jean Serge Muboyayi*
*Tracadie, New Brunswick, Canada*

**A.** With 2MB total RAM, you've got at most 1408K of extended memory. With that little memory, you're better off not allocating any to a disk cache. So delete the line that starts 'device=c:\windows-\smartdrv.sys' from your CONFIG.SYS. If you don't use a mouse in your DOS apps, you can also delete the line for MOUSE.SYS.

You'll get the most memory for your DOS apps by stripping your CONFIG.SYS down to the bare minimum. Microsoft recommends the following minimal CONFIG.SYS for a 2MB *Windows* system:

DEVICE=C:\HIMEM.SYS
DOS=HIGH *(DOS 5.0 only)*
FILES=60
BUFFERS=30

When you install more memory and start using more device drivers and memory-resident programs, you'll also want to invest in a memory manager, such as Quarterdeck's *QEMM-386* or Qualitas's *386MAX*. It will help you use your system's memory efficiently and give your DOS apps the most memory possible.

**WHERE TO BUY**

**386MAX version 5.12**
Qualitas, Inc.
7101 Wisconsin Ave. #1386
Bethesda, MD 20814-4805
800/659-0386, 301/907-0905 (fax)
LIST PRICE: $130
**Reader service no. 739**

**QEMM-386 version 6.0**
Quarterdeck Office Systems, Inc.
150 Pico Blvd.
Santa Monica, CA 90405
213/392-9851
LIST PRICE: $100
**Reader service no. 740**

### 25-MHz 286 vs. 20-MHz 386SX

**Q.** *I'm thinking of upgrading my old XT and have seen ads for 25-MHz 286 systems. Are these misprints, or is there actually such a chip? Do I really need a 386, or would one of these fast 286s do as well?*

*Nick Morano*
*Webster, Texas*

**A.** That's no misprint—AMD and Harris both make 25-MHz 286 chips. While these CPUs are used mostly in laptops, a few vendors are building desktop systems around them. However, the prices we've seen for these systems are the same as identically configured 20-MHz 386SXs'. When a program isn't specifically written to take advantage of a 386, the 286 could be up to 25 percent faster; but if you run a variety of applications, or *Windows*, the 386SX will provide better overall performance. Furthermore, a few programs—notably *Desqview 386* and *OmniPage*—already require a 386 or 486, and you'll also need a 386 or 486 to run future 32-bit versions of *Windows* and OS/2. All in all, we think a 386SX is a better choice than a 286, even at 25MHz.

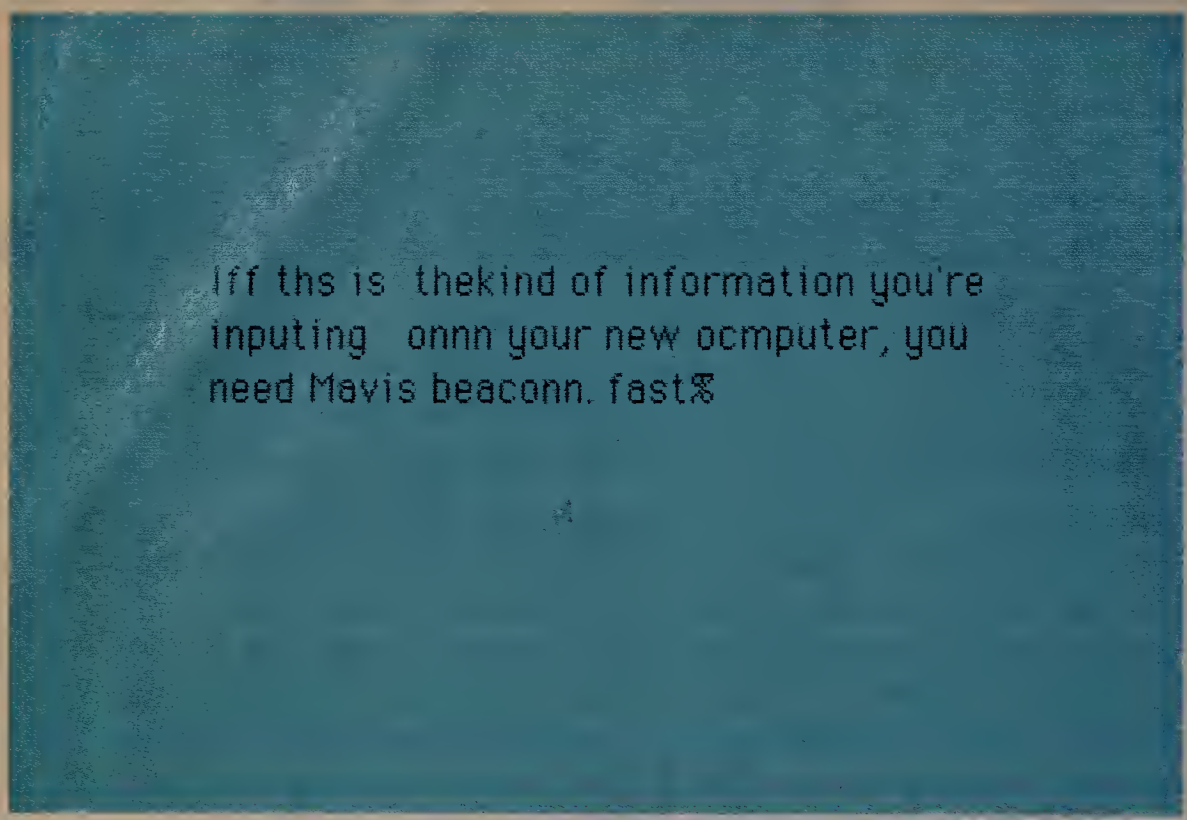
### Use Your Modem Anywhere

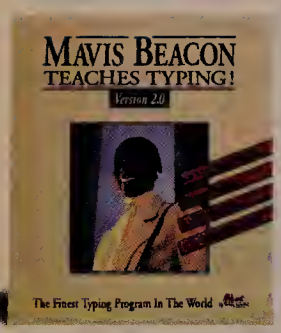
**Q.** *I spend most of my time on the road and use my laptop to keep in touch with the home office. Many of the hotels I stay in don't have regular telephone jacks, and my modem won't work. Is there some way to use my modem on these lines?*

*Cheryl Blake*
*via CompuServe*

**A.** We can't tell from your question if you're simply having trouble plugging the hotel phone line into your laptop's modem or if your modem is plugged in but doesn't work with the hotel phone system. If it's the latter problem, it could be that the hotel has a digital phone system. One way to connect your modem to a digital line is to plug in Consumer Products Plus's CP+ Connection II adapter between the phone and its handset and plug your modem into the adapter. This little 2-ounce gadget is the easiest way to go, but it works only when the phone in question has a modular handset. For a link that will work with any phone—digital or analog, modular handset or not (pay phones, for example)—get a miniature acoustic coupler, like Consumer Products Plus's 9-ounce Telecoupler or Information Machines'

ANTHONY RUSSO

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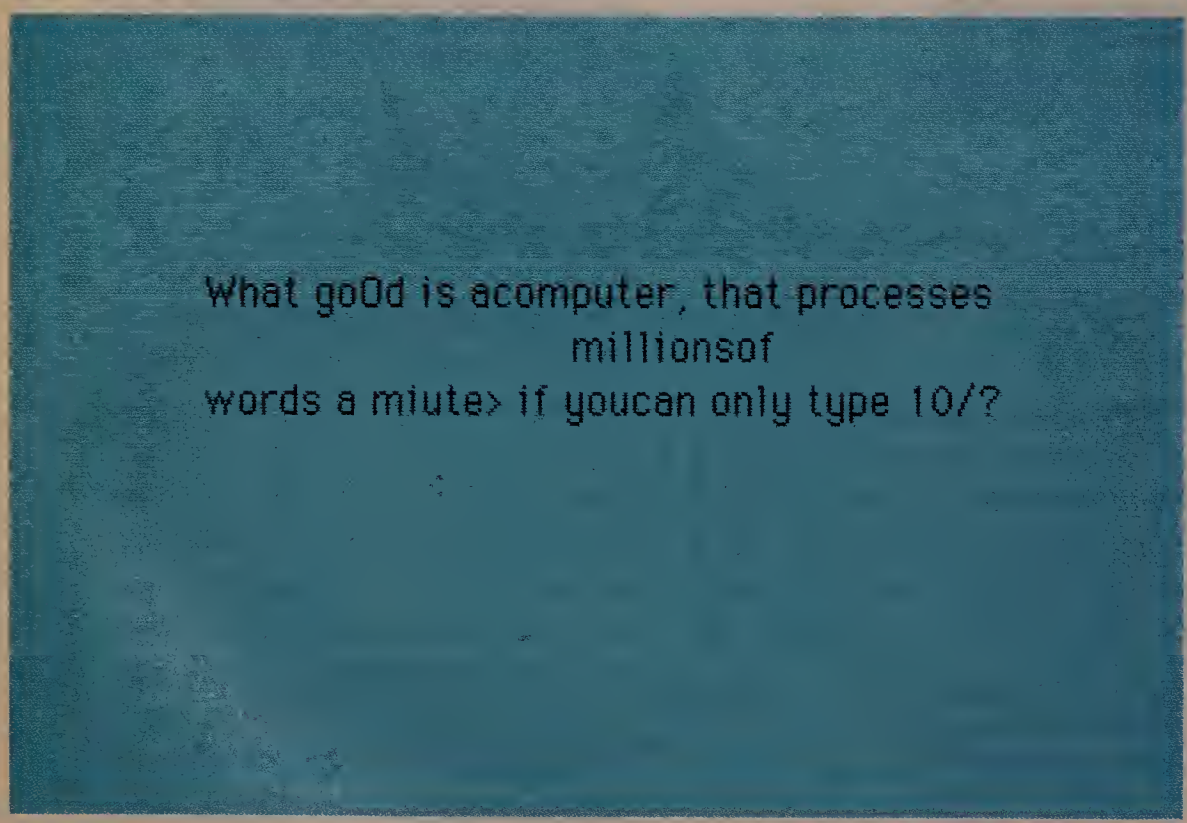


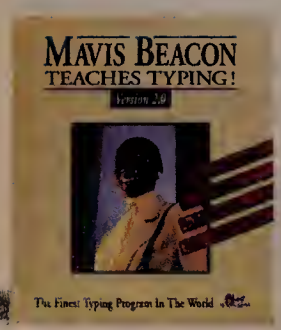


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6-ounce MA100. You plug your modem into the coupler and strap the coupler onto the telephone handset. A small speaker sends outgoing modem tones into the handset's mouthpiece, and a tiny microphone forwards the sounds from the earpiece into the modem.

### WHERE TO BUY

**CP+ Connection II,**
**CP+ Telecoupler**
Consumer Products Plus, Inc.
16351 Gothard St.
Huntington Beach, CA 92647
800/274-4277, 714/848-6850 (fax)
LIST PRICE: CP+ Connection II $100, CP+ Telecoupler $150
**Reader service no. 741**

**Modem Adapter MA100**
Information Machines
20219 Chapter Dr.
Woodland Hills, CA 91364
818/884-5779
LIST PRICE: $179
**Reader service no. 742**

## Recover Damaged WordPerfect Documents

**Q.** *Once in a while one of our* WordPerfect 5.0 *documents loses information—everything is okay for the first 20 or 30 pages, but when you cursor past a certain point, the computer freezes up and you have to reboot. We have to retrieve a copy of the document from the previous day's backup, losing whatever work we've done in the meantime—sometimes 100 pages or more of typing or editing. What causes this? Is there some way to repair the file so* WordPerfect *can read it again?*

*Jolle Yzquierdo*
*San Francisco, California*

**A.** Power dips and surges, static electricity, or passing cosmic rays can occasionally change one character in your computer's memory. In a text file, the damage is confined to that single character, perhaps changing "car" to "ôar." In a complex file structure like *WordPerfect's*, if the damaged character is a formatting code, the file may be unreadable. For instance, if the "end footnote 8"

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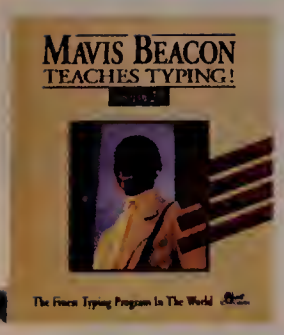


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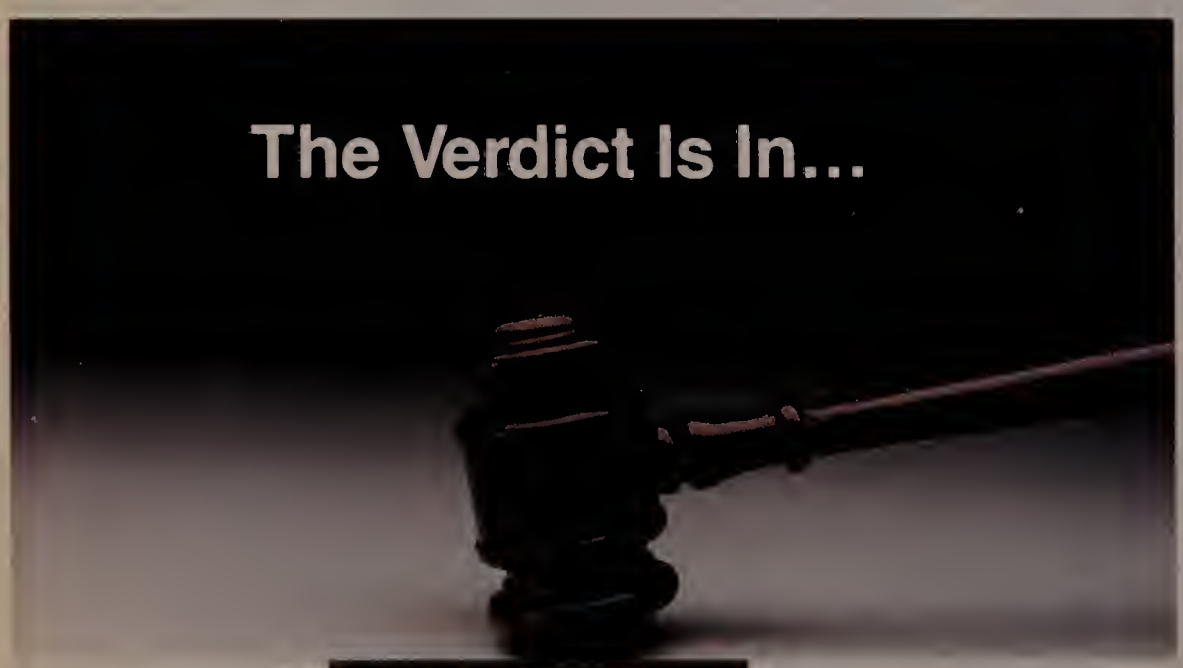

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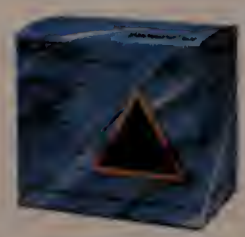

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code gets scrambled, *WordPerfect* will search the rest of the document looking for it and hang when it doesn't find it—more or less the problem you describe.

*WordPerfect File Doctor*, a shareware utility, can often repair such files or at least recover almost all the text. You can find the program as WPMD2-.ZIP on many BBS's or order it directly from the author.

But you have a bigger problem as well. There's no excuse for losing 100 pages of input. Save your file every few minutes; for example, at the end of every paragraph or page.

**WHERE TO BUY**

**Seidman's WPMD**
**The WordPerfect File Doctor**
Software by Seidman
2737 Devonshire Pl. NW
Washington, DC 20008
202/462-7381
LIST PRICE: $37
**Reader service no. 743**

### DOS 5.0 Meets Windows 3.0

**Q.** *Since I upgraded to DOS 5.0, whenever I try to start a DOS program under* Windows, *I get a message that the application has 'violated system integrity' and that I should close all applications and reboot. I found I can avoid this by disabling the Microsoft mouse driver (MOUSE.COM) before starting* Windows, *but I would like to be able to use the mouse in my DOS apps again. Is there a fix?*

*Paule E. Bible*
*Metairie, Louisiana*

**A.** Yes—get rid of your outdated mouse driver. You need to use the version of MOUSE.COM that comes with *Windows*, not the one that came with your system or mouse.

First, delete any old copies of MOUSE.COM from your hard disk. Then copy the EXPAND.EXE utility from *Windows'* Disk 2 to your \WINDOWS directory, and use it to copy the new MOUSE.COM (on 3½-inch Disk 5 or 5¼-inch Disk 4) to your hard disk by

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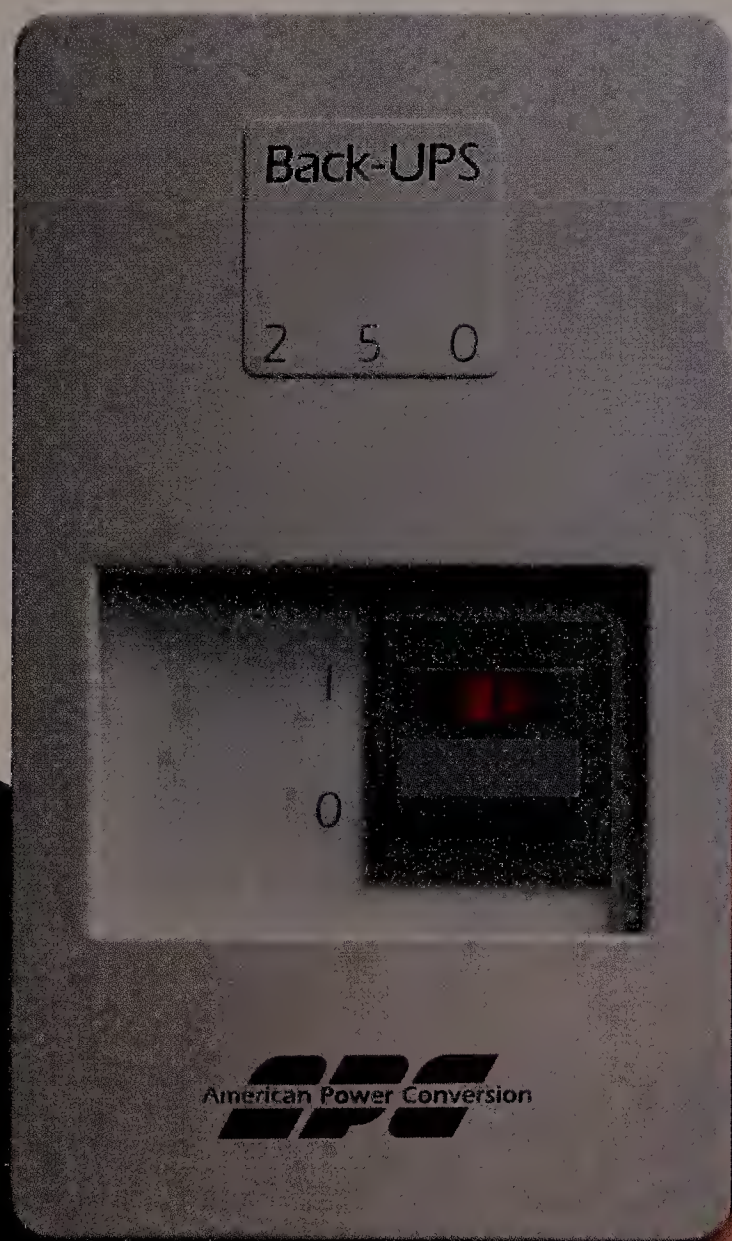


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| NEW! | Back-UPS 450 | Tower 386, 486 systems, servers | $329 |
| NEW! | Back-UPS 600 | Heavily configured systems, CAD/CAM workstations | $449 |
| | Back-UPS 800RT | Multiple systems, longer runtime applications | $899 |
| | Back-UPS 1200VX | Multiple systems, LAN hubs, small minis, telecom equipment | $1199 |

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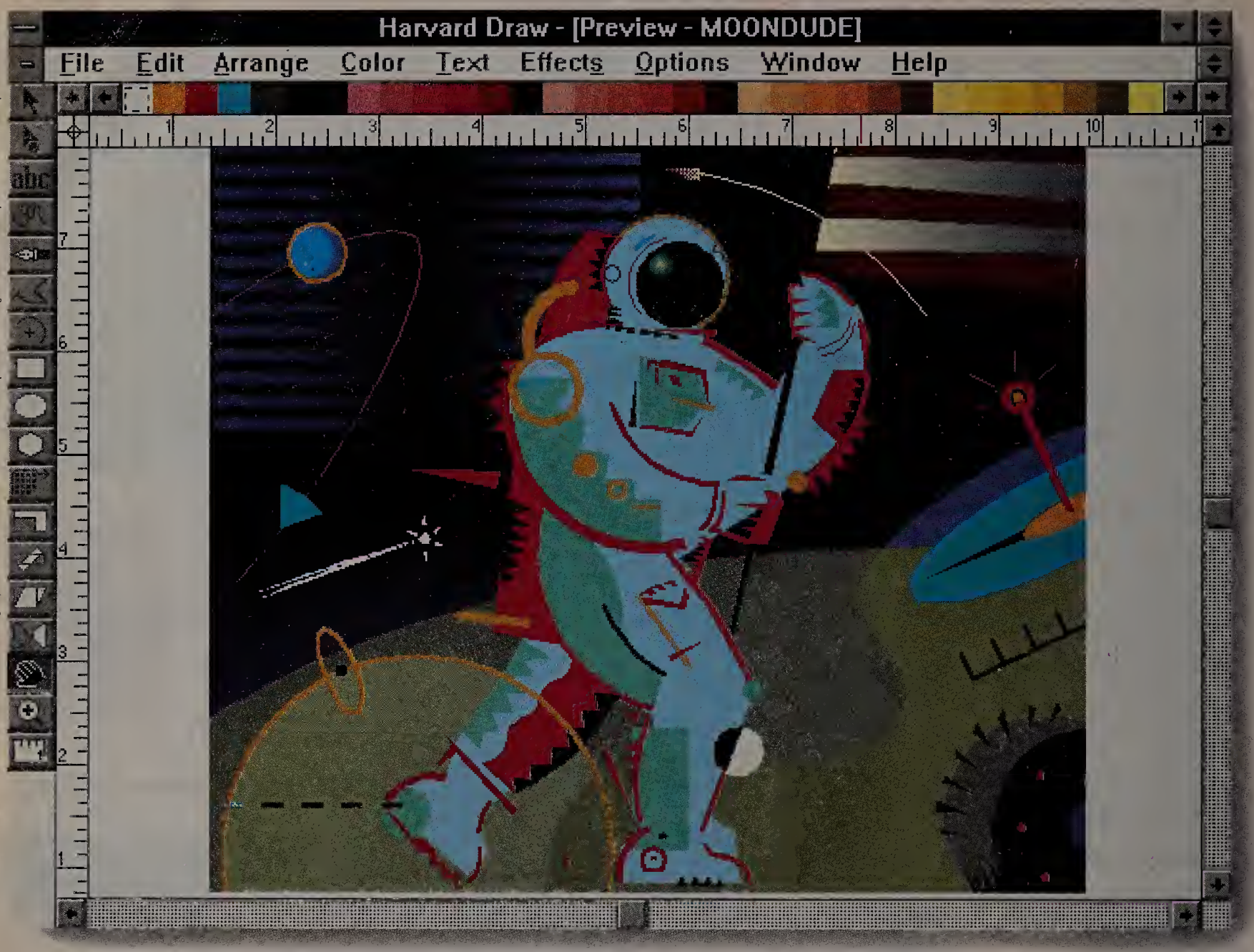


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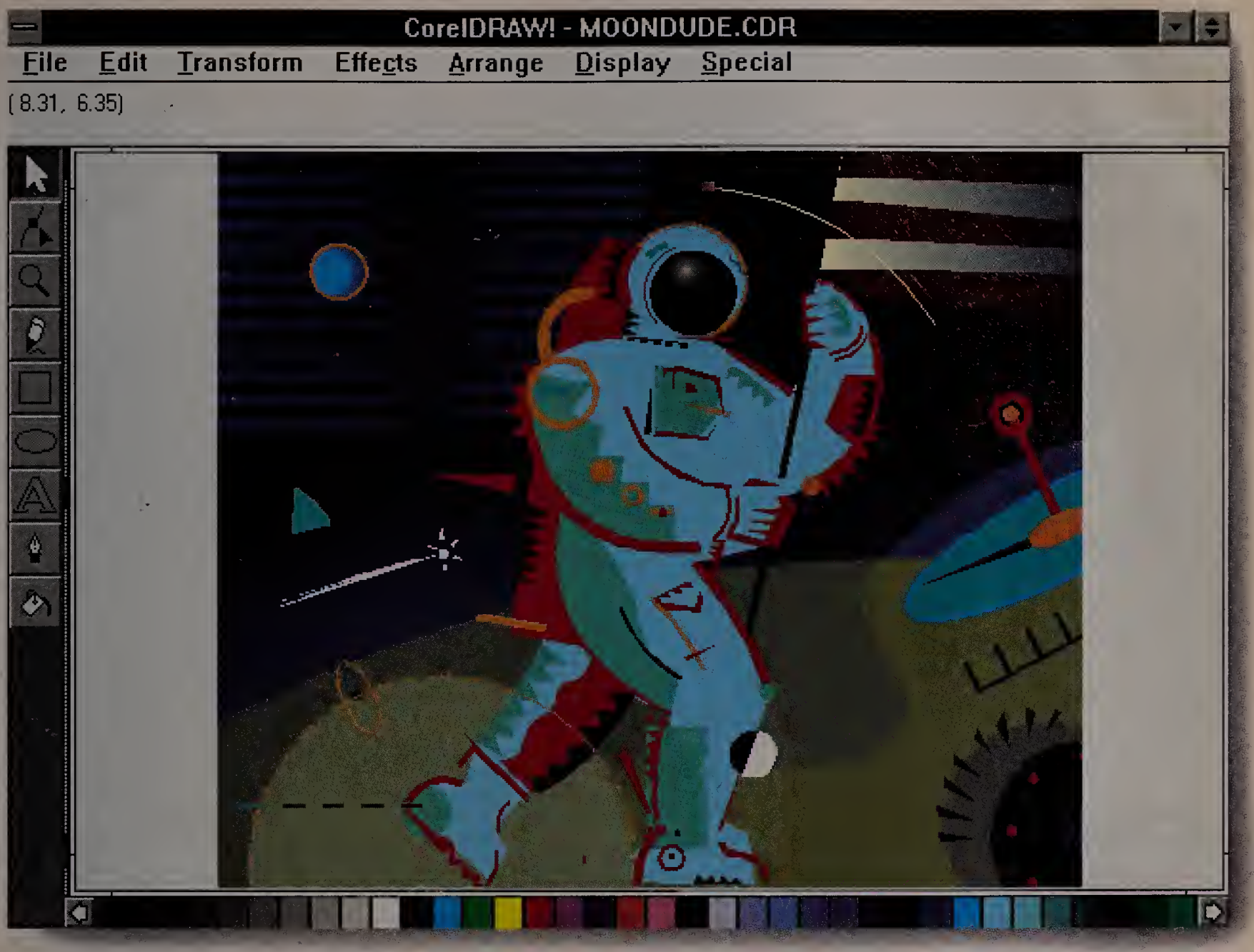


*Timed drawings were created by an experienced CorelDRAW user. For a summary of the test procedure and results write to Harvard Draw Test Results, Software Publishing Corporation, 3165 Kifer Road, Santa Clara, CA 95051

*3 hours and 13 minutes on CorelDRAW.*

# your own conclusion.

of a dialog box. There's a multiple undo option so you can erase up to 16 actions in a row. And our integrated autotrace is right in the toolbox. So you don't have to leave the program to use it.

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Moreover, in recent NSTL® benchmark tests, Harvard Draw proved several times faster than CorelDRAW in screen re-draws and file saves. And faster in other ways as well.

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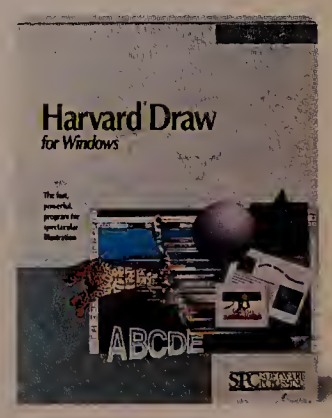


ows demo disk and a NSTL benchmark summary.

SPC SOFTWARE PUBLISHING CORPORATION

entering **EXPAND A:\MOUSE.COM C:\WINDOWS\MOUSE.COM** at the C> prompt. Finally, add the line **MOUSE /Y** to your AUTOEXEC.BAT file (be sure to put it *after* the PATH command). Omit the /Y switch if you have a Headlands (Video 7) video adapter.

### In Search of Interrupts Revisited

In September, we offered a few tips on the sticky problem of finding a hardware interrupt (IRQ) for each of your expansion boards. In brief, the AT uses 7 of its 16 interrupts itself. If you have COM1, COM2, LPT1, and LPT2 ports, they use IRQs 3, 4, 5, and 7, leaving only IRQs 2, 10, 11, 12, and 15 for expansion boards (the others have reserved uses). Since most boards can't use IRQs 10 and above, it's sometimes necessary to disable a port or two to free up IRQs for those boards, then use an external switchbox to hook up more than one peripheral to a port you haven't disabled—not an elegant solution.

We recently learned of several products that can help ease the interrupt request line crunch. Dual serial-port boards from Sealevel Systems and B&B Electronics let you assign their ports to any available IRQ levels, so you can free up IRQs 3 and 4 for use by less flexible boards. Though most communications software can access a COM port only by using IRQ 3 or 4, recent releases of some major programs can handle the other interrupts, and reportedly *Windows 3.1* will as well. Sealevel's Dual Printer Interface is basically an internal switchbox that lets two printers share a single LPT and thus a single IRQ. A memory-resident utility lets you switch between them by pressing a special <Ctrl>-*key* combination.

#### WHERE TO BUY

**Model 232CICC2**
B&B Electronics Manufacturing Co.
P.O. Box 1040
4000 Baker Rd.
Ottawa, IL 61350
815/434-0846, 815/434-7094 (fax)
LIST PRICE: $130
**Reader service no. 744**

**Comm+232/EX, Dual Printer Interface**
Sealevel Systems, Inc.
102 W. Main St.
Liberty, SC 29657
803/843-4343, 803/843-3067 (fax)
LIST PRICE: $179 each
**Reader service no. 745**

*Send your questions to Robert Lauriston, CompuServe 73707,1731; MCI Mail 381-7106; Internet duck@well.sf.ca.us; or 415/442-1891 (fax); or mail them to* The Help Screen, PC World, *501 Second St. #600, San Francisco, CA 94107.* PC World *pays $50 for published questions. Sorry, we cannot acknowledge submitted materials.*

*Karl Koessel is the technical editor and Robert Lauriston a contributing editor for* PC World.


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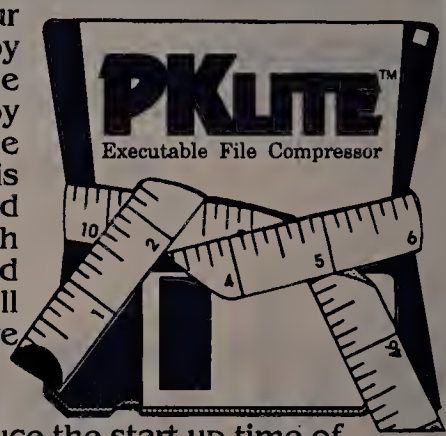


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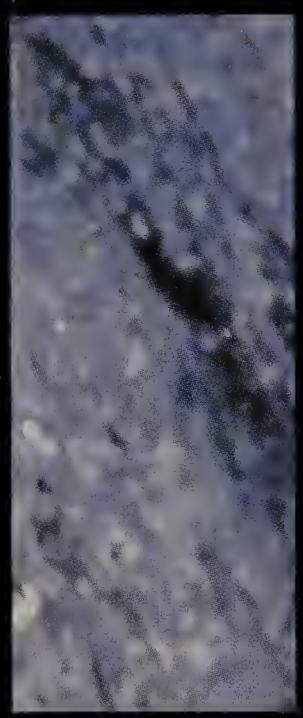
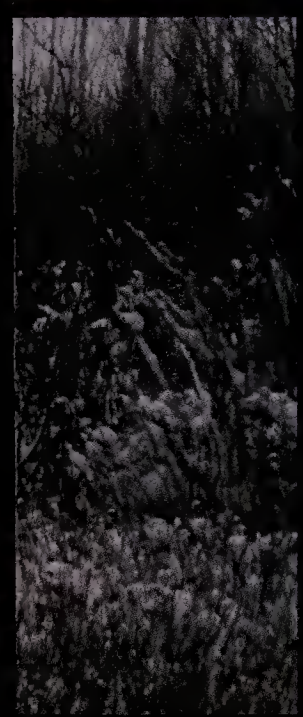


## Don't Fall Prey To High Prices.

The computer industry is a treacherous wilderness of sorts. In it you'll find dense thickets of confusing jargon. Swamps of advertising claims laced with quicksand to suck you in. And hungry predators hunting for prey. To prevent you from becoming a delicious lunch for one of them, we've prepared the Gateway 2000 pictorial survival guide for shopping in this wild kingdom.

*Guideline #1* – Don't fall prey to high prices. A number of PC manufacturers would have you believe a computer with their brand name is worth hundreds, even thousands of extra dollars. Is there intrinsic value in a name? The wily wilderness shopper knows that real value is a combination of features, performance, quality, service, company stability and price. The system that compares favorably in all of these categories is the best buy.

As you might expect, we think Gateway 2000 offers the best buy on the market. But don't take our word for it. Do the comparisons and see for yourself.



## Beware Of Those Who Would Turn Their Backs On You.

*Guideline #2* – Beware of those who would turn their backs on you. We've been in this industry for six years and we've seen a lot of PC manufacturers come and go. In the direct market channel, starting a business is easy. Staying in business is not. It's survival of the fittest, and the only companies that grow and prosper are those with an abiding commitment to quality and service and the financial strength to back it.

In the wilds of the computer industry, the savvy shopper studies the company as closely as the product. Is the company strong and successful? What do customers say about the company's commitment to quality and service?

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GATEWAY2000

*"You've got a friend in the business."*

# GATEWAY 2000 SYSTEMS

## 16MHZ 286

- 80286 Processor
- 2 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 512K
- 14" Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 1 PS/2 Mouse Port
- 124-Key AnyKey™ Keyboard
- MS DOS® 5.0

**$1345**

## 16MHZ 386SX

- Intel® 80386SX Processor
- 2 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 512K
- 14" Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 1 PS/2 Mouse Port
- 124-Key AnyKey Keyboard
- Microsoft® Mouse
- MS DOS 5.0
- MS Windows™ 3.0

**$1445**

## 20MHZ 386SX

- Intel 80386SX Processor
- 32K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
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- 14" Crystal Scan 1024 Color VGA Monitor
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**$1745**

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- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

**$1945**

## 33MHZ 386

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- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

**$2445**

## BEST BUYS

- Get our 33 MHz 386 system, same configuration as listed, with a 120 MB IDE hard drive instead of the 200 MB drive.

**$2195**

- Same features as our 33 MHz 486 system except this machine has 4 MB RAM, instead of 8, and a 120 MB IDE hard drive, instead of the 200 MB drive in our standard configuration.

**$2545**

## 33MHZ 486

- Intel 80486 Processor
- 64K Cache RAM
- 8 MB RAM, Expands to 64 MB
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
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- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

**$2995**

## 33MHZ 486 EISA

- Intel 80486 Processor
- 128K Cache RAM
- 8 MB RAM, Expands to 64 MB
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- 340 MB 15ms SCSI Drive with 128K Multi-Segmented Cache
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- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

**$3895**

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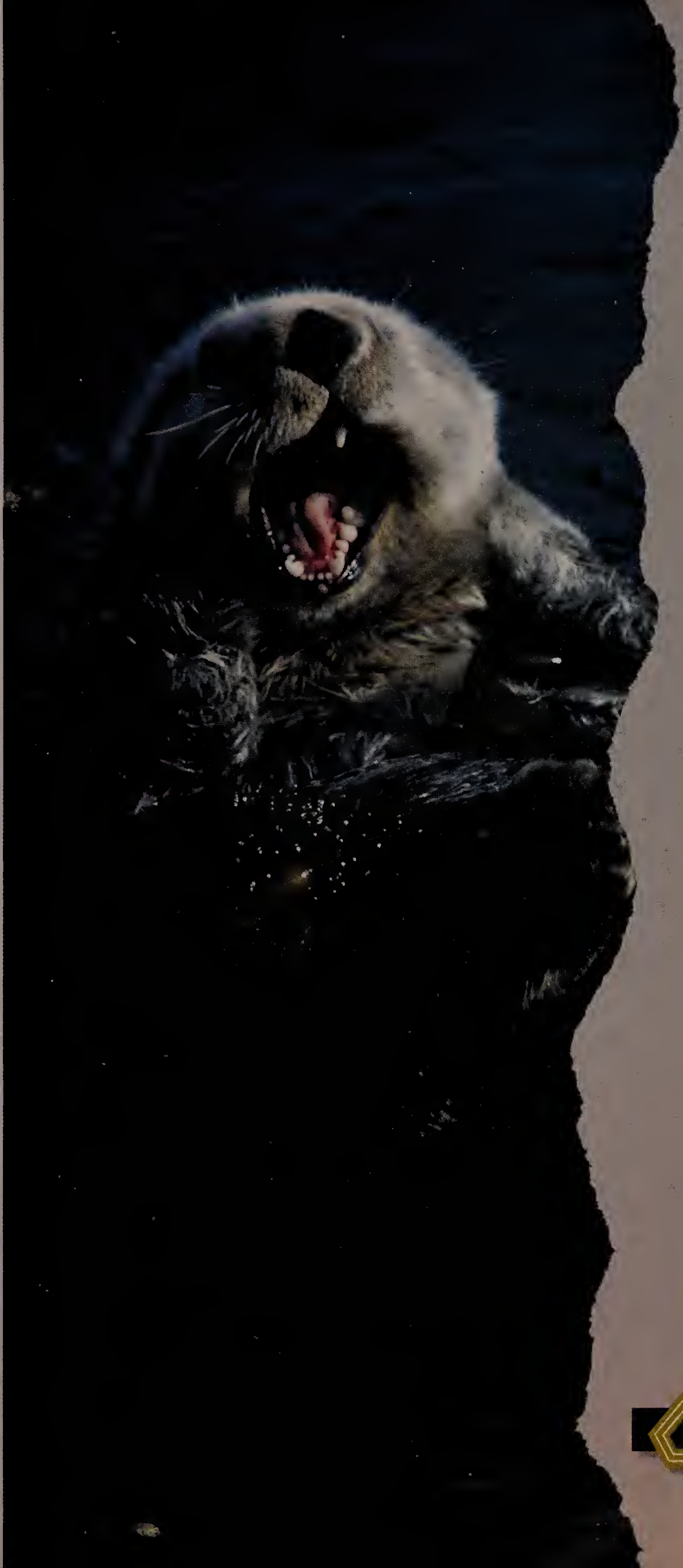
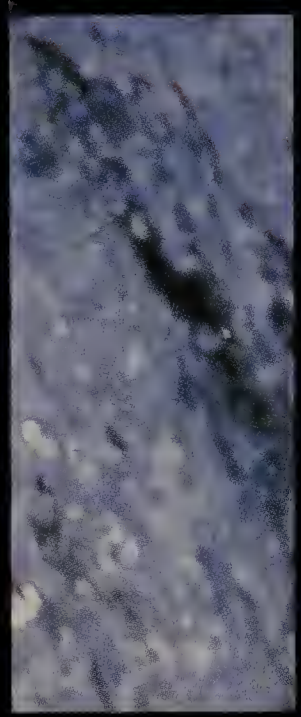


# Guidelines For Safe Shopping...

GATEWAY2000

# ...In The Wilds Of The C

# omputer Industry.



## Don't Fall Prey To High Prices.

The computer industry is a treacherous wilderness of sorts. In it you'll find dense thickets of confusing jargon. Swamps of advertising claims laced with quicksand to suck you in. And hungry predators hunting for prey. To prevent you from becoming a delicious lunch for one of them, we've prepared the Gateway 2000 pictorial survival guide for shopping in this wild kingdom.

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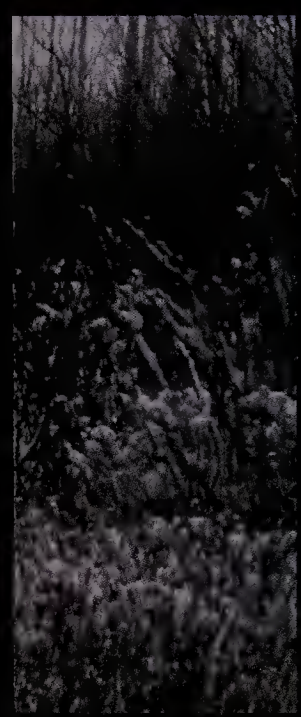

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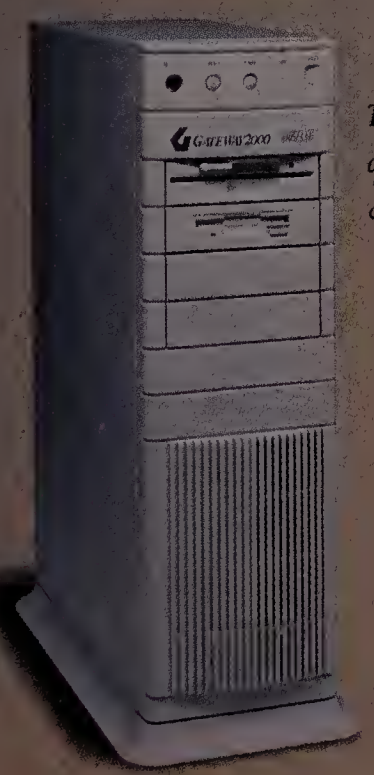
# GATEWAY 2000'S SANCTUARY OF VALUE

*286/16, 386SX/16 & 386SX/20 systems come in a mini desktop model.*

*The desktop model is standard for 386DX & 486 systems.*



*The tower model is an option for 386DX & 486 systems.*

## Mini Desktop Systems

Our 286 and 386SX systems come in a compact, mini desktop model that's just 4.25 inches high, 16.25 inches wide and 16 inches deep. These systems feature a custom-designed, integrated motherboard to create a more reliable system. To give you plenty of room for expansion in a small footprint computer, we integrated the diskette drive controller, the video chip set and the I/O card on the motherboard, leaving five 16-bit slots open in the standard configuration. The mini desktop models also have a standard mouse port (PS/2 compatible), leaving two serial ports open.

## Desktop Systems

Standard configurations for Gateway's 386 and 486 systems include all the features you want for optimum performance with the latest software. You don't have to study our configurations to figure out what's missing. All systems have plenty of RAM, two diskette drives, high capacity, fast and reliable hard drives, super fast 16-bit VGA graphics with 1 MB RAM and 1024 x 768 non-interlaced color monitors. It's all there – for an unbelievably good price. 386DX and 486 systems come standard in a desktop model. Our tower model with a 220 watt power supply is available as an option for an additional $100.

## New 33 MHz 486 EISA

If you've been waiting for an affordable EISA system, your wait is over. With a 340 MB SCSI drive and 32-bit EISA SCSI controller, Gateway's 33 MHz 486 EISA system is incredibly priced at only $3895.

## Peripherals

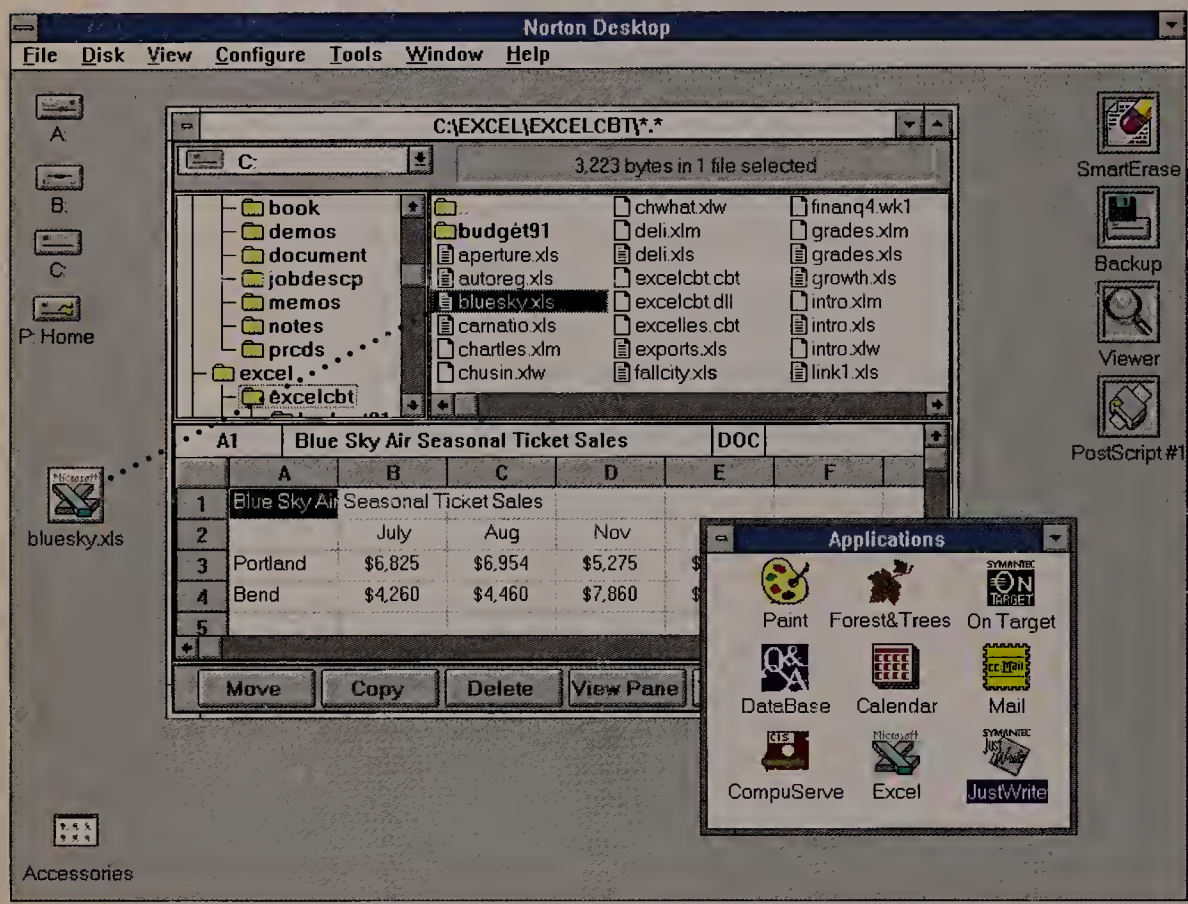
We sell and support a complete line of competitively priced, quality name-brand peripherals, including laser and dot matrix printers, modems, tape backups and coprocessors. Sorry – we sell peripherals and components only with the purchase of a system, or separately only to owners of Gateway 2000 systems.

## The Extras – That Don't Cost Extra At Gateway

- One-year warranty on parts and labor
- Replacement parts shipped quickly via overnight shipping at no charge
- 30-day money-back guarantee
- Lifetime toll-free technical support from the service organization that won PC World's Service Excellence Award
- Free on-site service to most locations
- Free bulletin board technical support
- C.O.D. terms and major credit cards honored
- Net 30-day credit terms and leasing options available to qualified commercial customers
- MS DOS 5.0 is standard; versions 4.01 and 3.3 are available at no extra charge
- The programmable AnyKey keyboard is standard; a 101-key keyboard is also available at no extra charge
- Software diskettes and comprehensive hardware and software manuals provided
- Canadian customers – our 800 number is toll-free from Canada and systems (excluding monitors and keyboards) are now duty-free!

Sales Hours: 7am-10pm Weekdays, 9am-4pm Saturdays (Central Time)
Service Hours: 6am-Midnight Weekdays, 9am-2pm Saturdays (Central Time)

# INTRODUCING THE BEST THING THAT EVER HAPPENED TO WINDOWS.




*The Norton Desktop integrates a file manager and program manager into one seamless desktop.*

## THE NORTON DESKTOP™ FOR WINDOWS.™

Now you can make Windows perform the way you've always wanted—without changing the way you use it. Because The Norton Desktop is the perfect companion for Windows.

For starters, you can move your programs and file groups from the confinement of the Windows Program Manager to the freedom of The Norton Desktop. It's like having your file manager and program manager transparently integrated—all for just $149*!

The Norton Desktop's enhanced file manager allows you to launch, copy, move, view and delete a file or application by clicking and dragging icons on the desktop. You can also print documents by dragging files to any printer icon. In fact, our icon editor makes it easy to select any of the more than 150 icons provided, while The Norton Viewer enables you to instantly view files from over 30 Windows and DOS applications.

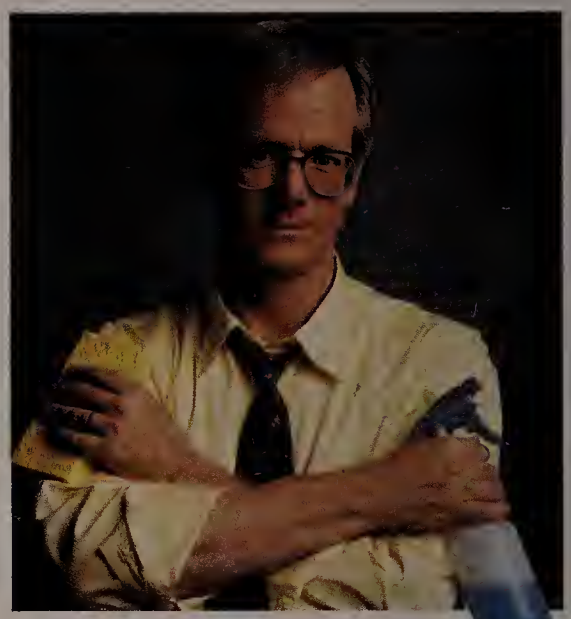
***"We took one look at The Norton Desktop for Windows, and it instantly became the way we'll compute in Windows from now on."***

*—PC Computing, August '91*

Norton Backup

Not only does the Norton Desktop make sure your files are well managed, it also ensures they're well protected.

We've included The Norton Backup™ for Windows,** one of the fastest, most reliable backups you can buy. You can easily set-up automatic backups for any time of the day or night, whether you're present or not, and backup in the background, even to and from network drives.



*Peter Norton*

And The Norton Desktop provides the easiest UnErase™ever, for stand-alone PCs and network systems, plus the industry's most powerful automatic disk diagnosis.

UnErase

It also includes a rich assortment of screen savers, along with our SuperFind™ text searching, enabling you to quickly search and find files on any disk drive—even on networks.

So if you're ready to improve your Windows, visit your nearest dealer or call **1-800-343-4714, Ext. 722W** for more information about the Norton Desktop. It could be the best thing that ever happened to your PC.

SYMANTEC.™

*Suggested retail price, USA only. **Also available separately for $129 (MSRP). © 1991 Symantec Corporation. All rights reserved. The Norton Desktop for Windows is a trademark of Symantec Corporation. All other brand or product names mentioned are trademarks of their respective holders.

**Circle 266 on reader service card**

# CONSUMER WATCH

Advice and information for the computer consumer

*Christine Whyte*

### Taking Stock of Superstores

The shopping phenomenon of the nineties, computer superstores are changing the way America shops. The typical superstore offers thousands of hardware and software products at huge discounts in a warehouse setting.

While superstores boast competitive pricing and broad selection, they earned an early reputation for having uninformed salespeople and lacking after-sale support and service. To see if this was true, a team of reporters posed as computer-savvy customers about to open a small business on a tight budget—a typical superstore customer profile. We visited four superstores that belong to the larger chains, with five or more stores in various cities.

*CompuAdd*
*Alexandria, Virginia (Washington, D.C.)*
CompuAdd, the Texas-based computer maker, has long sold its equipment through mail-order ads, but it also has a chain of superstores. CompuAdd stores' biggest drawback is that they carry only their own systems. On the plus side, the CompuAdd 20-MHz 386SX we priced was quite competitive: $2140 with 4MB of RAM, an 80MB hard drive, one high-density floppy drive, and a VGA monitor. This system was in stock with optional next-day delivery.

The printer selection was more diversified, with models from various companies. The HP LaserJet IIIP was a good deal at $1029 (list price $1595). The newly opened store I visited will soon carry all major software programs.

I found the staff helpful and knowledgeable. My salesperson suggested I buy only the standard 2MB of RAM until I know my system needs. He also recommended spending an extra $300 for the 386SC system, which includes a high-performance 32K memory cache—worthwhile advice.

CompuAdd offers a standard one-year warranty on everything they sell and a year's extended warranty (for 10 percent of the purchase price). You can

## Superstores Nationwide

| Name | Location | Number of Stores |
|---|---|---|
| ACP SuperStore | Santa Ana, California | 1 |
| Ballard Computer, Inc. | Seattle | 2 |
| CompuAdd | Alexandria, Virginia; Chicago; Dallas; Louisville, Kentucky; Portland, Oregon | 5 |
| CompUSA | Atlanta; Chicago; Dallas/Ft. Worth; Denver; Detroit; Houston; Kansas City, Kansas; Los Angeles/Orange County; Miami; Philadelphia; San Diego; San Francisco/Santa Clara; Washington, D.C. | 20 |
| Computer City SuperCenter | Austin, Texas; Buffalo; Detroit; Garden Grove, California; Houston, Texas; Minneapolis; Seattle | 8 |
| Computer Discount Warehouse | Chicago | 2 |
| Computer Expo | Houston | 2 |
| The Computer Store of Kentucky, Inc. | Louisville, Kentucky | 1 |
| Computer Warehouse | Cherry Hill, New Jersey; King of Prussia and Langhorne, Pennsylvania | 3 |
| ComputerLand Express | Atlanta | 1 |
| Computers Etc. | Peabody, Massachussetts | 1 |
| Elek-Tek | Chicago | 3 |
| Fry's | Fremant, Pala Alta, and Sunnyvale, California | 3 |
| J&R Computer World | New York | 1 |
| LDI | Cleveland | 1 |
| Micro Center | Atlanta; Cincinnati; Cleveland; Calumbus and Westerville, Ohio | 5 |
| Whole Earth Access | Sacramento, California | 1 |

ANTHONY RUSSO

also buy an on-site service agreement, which costs $90 for the first year. In any event, the manager at the Alexandria store swears "you won't be down more than a day."—*Patrick Marshall*

*CompUSA*
*Santa Clara, California (San Jose)*
CompUSA is the largest nationwide superstore chain. When I visited the company's Santa Clara store deep in Silicon Valley, I found an expanse of PCs, software, peripherals, and accessories. The systems included models from Dell and Leading Technology and the house brand, Compudyne. The best deal I found on a 20-MHz 386SX was the Compudyne system with VGA monitor, 80MB hard disk, one floppy drive, and 4MB of RAM for $1564. Prices for the popular business software on my shopping list ranged from 30 to 52 percent off list. So far so good.

But I was surprised the store didn't carry the HP LaserJet IIIP, an industry standard. A salesperson in the printer department made a convincing pitch for the Epson EPL-7000 ($820), which he said was comparable: "Go out and price the Hewlett-Packard and see if it has all the features this one has." The other salespeople I spoke to seemed of equally high caliber; the systems department salesperson even explained in plain English the difference between MCA, ISA, and EISA buses.

I also found good after-sale service. CompUSA offers a $49 in-store service contract for one year on all systems it assembles, and one-year on-site service contracts through Texas Instruments for $129. Warranty extensions are available for systems and printers; their cost depends on the type of hardware.
—*Dan Miller*

*Computer City SuperCenter*
*Garden Grove, California (Los Angeles)*
If the vastness of Computer City SuperCenter doesn't put you in awe, its endless selection of goodies will. The variety of systems ranged from AST to IBM to USIT—the house brand—and prices were low. When I asked for the best buy on a 20-MHz 386SX system with 4MB of RAM and a color VGA display, a friendly salesperson steered me to an NEC system with an 80MB hard drive and a high-density floppy drive for $2042. Although the store had many such systems in stock, the hard drives were on back order.

The software department proved less lavish and offered mostly popular business applications and a few games, all of which were stocked in depth. Software prices are excellent, averaging about $10 more than Egghead's.

In addition to free in-house service for a year, you can buy extended warranties and on-site service. The prices weren't yet established since Tandy had just acquired the chain, but they'll run between 6 and 10 percent of the price, depending on the hardware.

# How Dr. Jeff Ausen keeps his patients smiling between fillings.

He uses Express Publisher 2.0 to create this clever and professional newsletter. It's a painless way for Dr. Jeff to "flossophize" and keep in touch with his patients.

**The leading DOS desktop publisher for under $160.** Express Publisher won *Compute* Magazine's 1991 Choice Award for ease of use and publishing power. It comes complete with eight fonts you can instantly size, and over 100 clip art images. Only Express Publisher gives you TextEffects™, which let you curve, rotate and shadow text for eye-catching logos, headlines, bursts and more.

Dr. Ausen uses Express Publisher to easily create professional-looking newsletters. And you can too – without taking a bite out of your time or your wallet.

**SPECIAL OFFER:** If you already own any other desktop publisher, trade up to Express Publisher for just $49.95!*

Power Up!

**To order, or for the dealer nearest you, call 1-800-851-2917, Ext. M130**
**7 a.m. - 5 p.m. PST**

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DOS VERSION

**Circle 211 on reader service card**

The next day I called my salesperson to see if he remembered me and what I had looked at. He had all the right answers. —*TJ Byers*

*Micro Center*
*Marietta, Georgia (Atlanta)*
Micro Center, which began life in 1980 as a small retail store in Columbus, Ohio, has entered into the megastore business. When I visited the Marietta Micro Center, I was pounced on almost immediately by a salesperson, but the pitch was professional in a white-shirt, striped-tie kind of way. When I inquired about bargains on a 386SX 20-MHz machine, I was led to a Video Technology Laser system with a high-density floppy drive. (Micro Center is also an authorized dealer for IBM and Compaq.) Adding 4MB of RAM, an 85MB hard drive, and a Laser VGA display brought the price to $1553; DOS and *PC Tools Deluxe* were included. The business software that I priced was readily available at 33 to 52 percent discounts.

The salespeople I dealt with were friendly, although the first person I spoke to wasn't knowledgeable about the *WordPerfect* demo. He tried to show me the program but didn't know to press <F5><Enter> to display the list of files, telling me that the demo machine had no files. Later I talked to another salesperson, who was well-informed about prices and store policies.

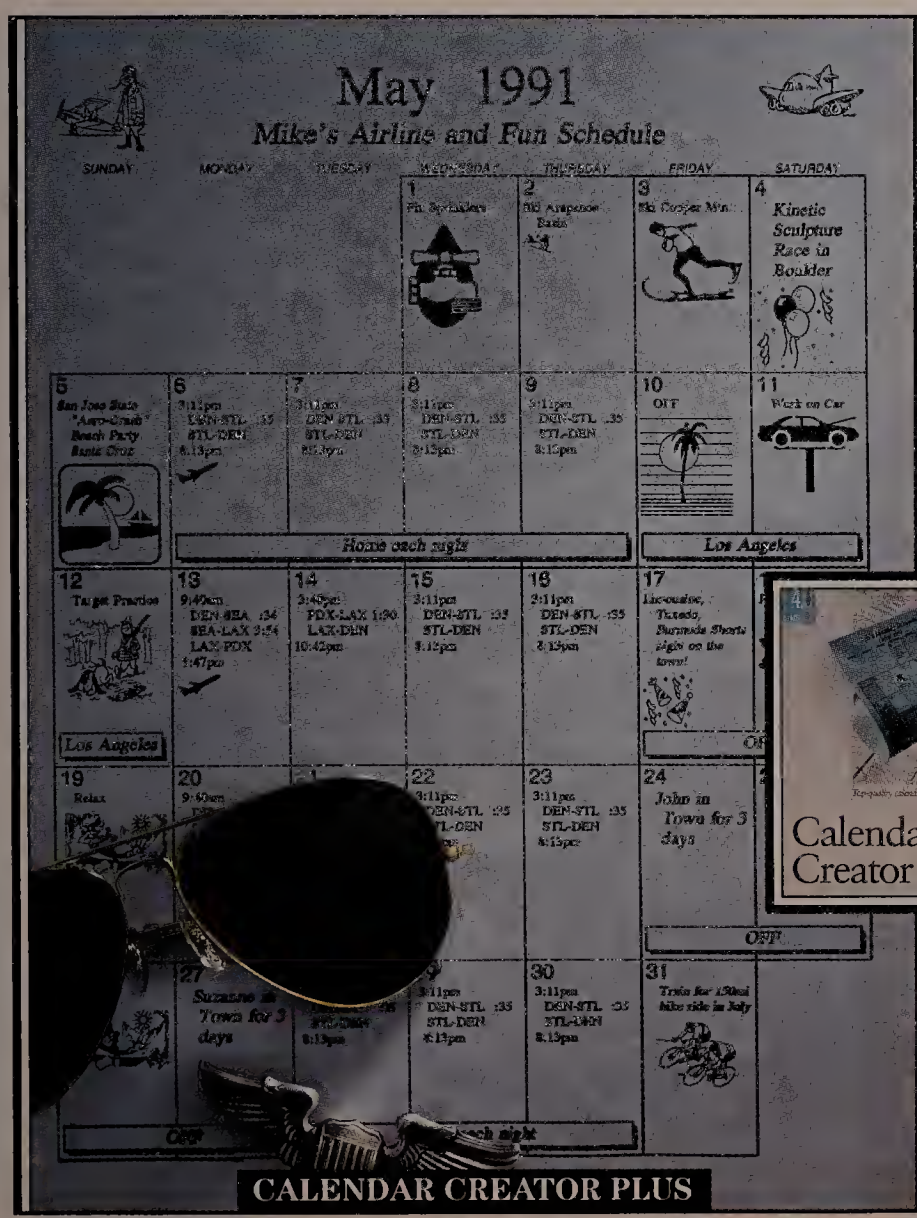
This Micro Center offers one year of free service. On-site service isn't available, but the store sells warranty extensions priced according to the hardware. The store also has a large bookstore and classrooms, used for a range of courses.
—*Gary Pelphrey*

We had such good luck at superstores, we wondered: Will K mart shopping ever replace mail order? Dell and Gateway—the top two mail-order companies—offer comparable prices, and one year of on-site service is part of the deal. But superstores have other advantages: one-stop shopping for a slew of products, a look at products before you buy, and the capability to mix and match components. Best of all, you'll probably carry out your purchases the same day.

## SHOP TALK

### "Nonregistered" Shareware May Be Bundled With Hardware

I wanted to buy a modem for my laptop computer but had no communications software to run one. I chose the Easy-Talk Internal Laptop Modem from Megahertz Corporation because the box said it contained *Procomm* communications software from Datastorm Technologies. When I later saw ads for a *Procomm* upgrade (*Procomm Plus*), I decided to pay the $39 upgrade price. When I called Datastorm, they said I couldn't upgrade until I registered the old version for $50, or I could pay $99 for the new version. I feel I've been had:


# How pilot Mike O'Neal keeps on schedule between flights.

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**Circle 213 on reader service card**

Why should I pay to register the *Procomm* software I already paid for?

*Philip Ventura*
*Randallstown, Maryland*

**Megahertz Corporation responds:** Megahertz has opted to provide at its own cost a *nonregistered* version of *Procomm* software with its modems. According to our company's software bundling agreement with Datastorm Technologies, a Megahertz customer receives full rights to use the *Procomm* software. Megahertz is required to provide any necessary technical support, and we choose to do so with a toll-free support line. However, Megahertz does not provide upgrades for any of our bundled software packages.

*Nancy Warr*
*Press Relations Manager*

**Datastorm Technologies adds:** Technical support from Datastorm, special offers on upgrades, company newsletters, and other product information are available only to users who registered their software with Datastorm.

*Suzanne Mitchell*
*Marketing Manager*

### That Ol' Busy Signal

*Editor's note: We received three letters this month complaining about difficulty getting through to Gateway 2000's technical support line. The writers report that the toll-free number was often busy for hours or days on end. The following is an excerpt from one of the letters:*

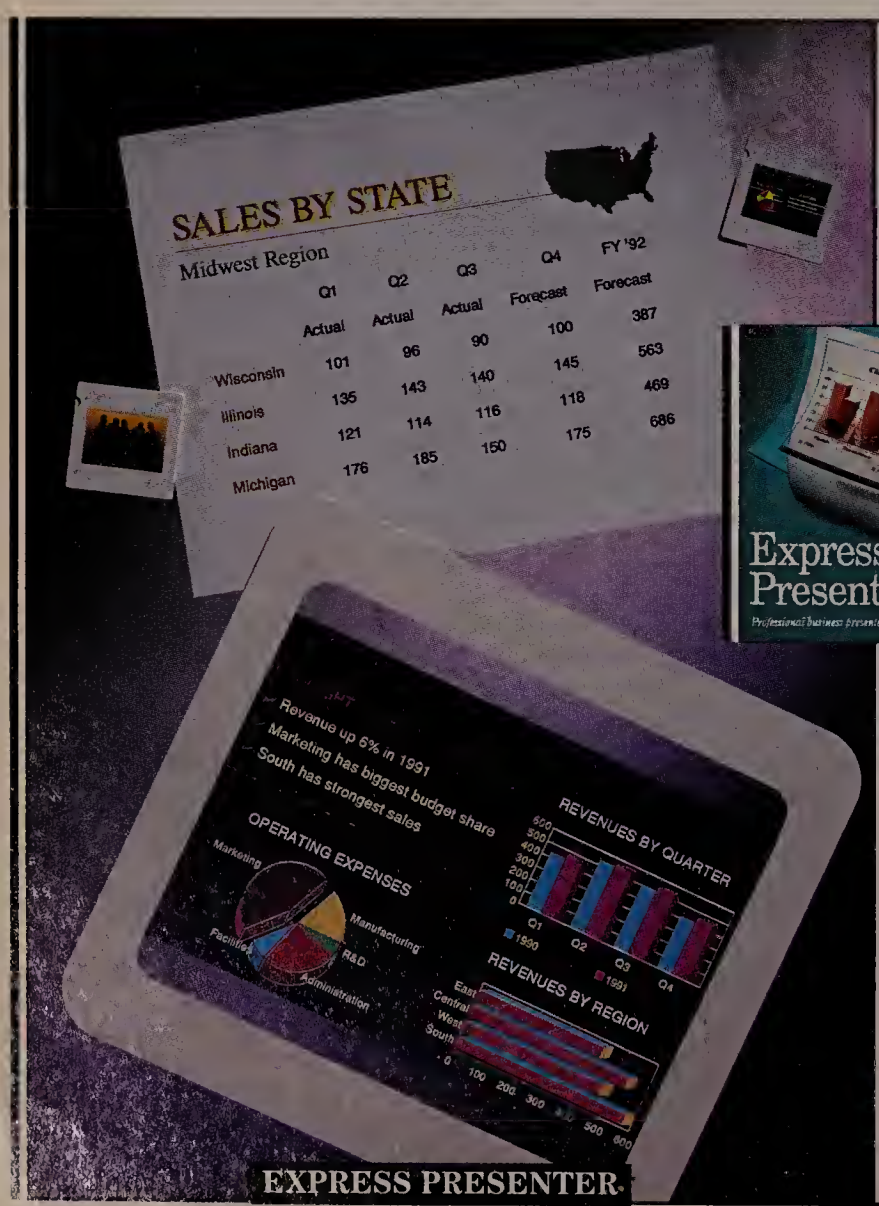
Our company received a 20-MHz 386SX from Gateway and lost the video after half an hour of use. Two days after we phoned Gateway, a tech support person called back and promised a new motherboard would be shipped via next-day air mail. A week later we finally received the board.

After we installed the new motherboard, the computer locked up. Our attempts to reach technical support over the next three days were met with busy signals. At this point we were getting desperate, so I called the company's commercial number. Twice we were shuffled to technical support, where we were put on hold, cut off, and finally told someone would call us back.

We waited three days for a call, and meanwhile got nothing but busy signals when we tried to contact technical support. Finally we returned the machine and bought one from another company. The message is clear: Gateway should spend more money on technical support staff and less on advertising.

*Jo Anne Cox*
*Gaylord, Michigan*

**Gateway 2000 responds:** First, I would like to apologize for the frustrations Jo Anne Cox experienced. In August we changed the way we handle technical calls in order to improve our efficiency. We also increased our techni-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**Circle 219 on reader service card**

cal support staff by 100 percent and added 96 telephone lines. With our new procedures in place, our technicians now handle approximately 3900 calls a day. Situations like Ms. Cox's help remind us that customer satisfaction is a goal we must constantly strive for.

*Glen W. Mille and Terri Ford*
*Gateway 2000 Customer Satisfaction*

**Lotus's New Customer Service**

Last February I purchased *1-2-3 3.1*. Soon thereafter, I was pleased to find a special offer of *Ami Pro 1.2* for anyone acquiring *1-2-3 3.1* before March 31. When I called Lotus, a representative asked for the *1-2-3 3.1* copyright page and $19.95, which I sent off immediately. In May I called to ask why I hadn't received *Ami Pro*. I was told the demand had exceeded supplies and I would receive my program in four to six weeks. On July 23 I called again with the same question. I was told my check had been returned by mail in early June. However, I had received no correspondence from anyone at Lotus. On August 2 my bank informed me that Lotus had cashed my check. I purchased a Lotus product in good faith; can Lotus respond accordingly?

*Carl W. Sandage*
*Russellville, Kentucky*

**Lotus Development Corporation responds:** Mr. Sandage's letter was forwarded to the newly formed Lotus Customer Relations Group. We immediately called Mr. Sandage and informed him that a package of *Ami Pro* was on the way to him. A follow-up call to Mr. Sandage confirmed that he was satisfied with both the product and the way his complaint was handled by the Customer Relations Group. The group's mission is to record compliments and complaints from our customers, to satisfy customers who have complaints, and to analyze and report on the cause of customer complaints. In Mr. Sandage's case, Customer Relations has achieved the first two goals; we now are analyzing why Mr. Sandage's problems occurred and how we can avoid similar situations.

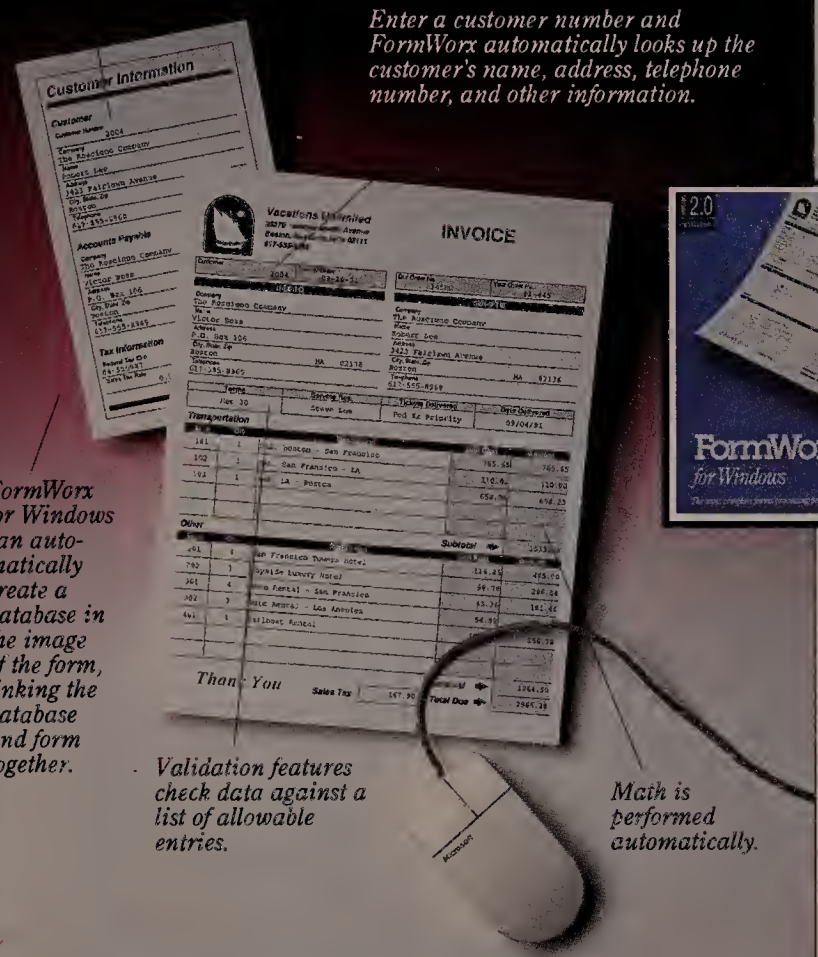
*Jeff Delson*
*Manager, Lotus Customer Relations*

*Think you've gotten a raw deal—or a great one? Send the details to* Consumer Watch, PC World, *501 Second St. #600, San Francisco, CA 94107; MCI Mail PC World Editorial; CompuServe 74055,412; or 415/442-1891 (fax). We'll investigate complaints and publish letters with the broadest interest.*

*Christine Whyte is a freelance editor in San Francisco. Patrick Marshall is a freelance writer. Dan Miller is the Fluegelman Intern and TJ Byers is a contributing editor for* PC World. *Gary Pelphrey is an attorney.*


*If you've typed it once, there's no need to type it again. FormWorx captures data the first time a form is filled in. Data entered into one form can be automatically looked up to fill other forms.*

*Enter a customer number and FormWorx automatically looks up the customer's name, address, telephone number, and other information.*




*FormWorx for Windows can automatically create a database in the image of the form, linking the database and form together.*

*Validation features check data against a list of allowable entries.*

*Math is performed automatically.*

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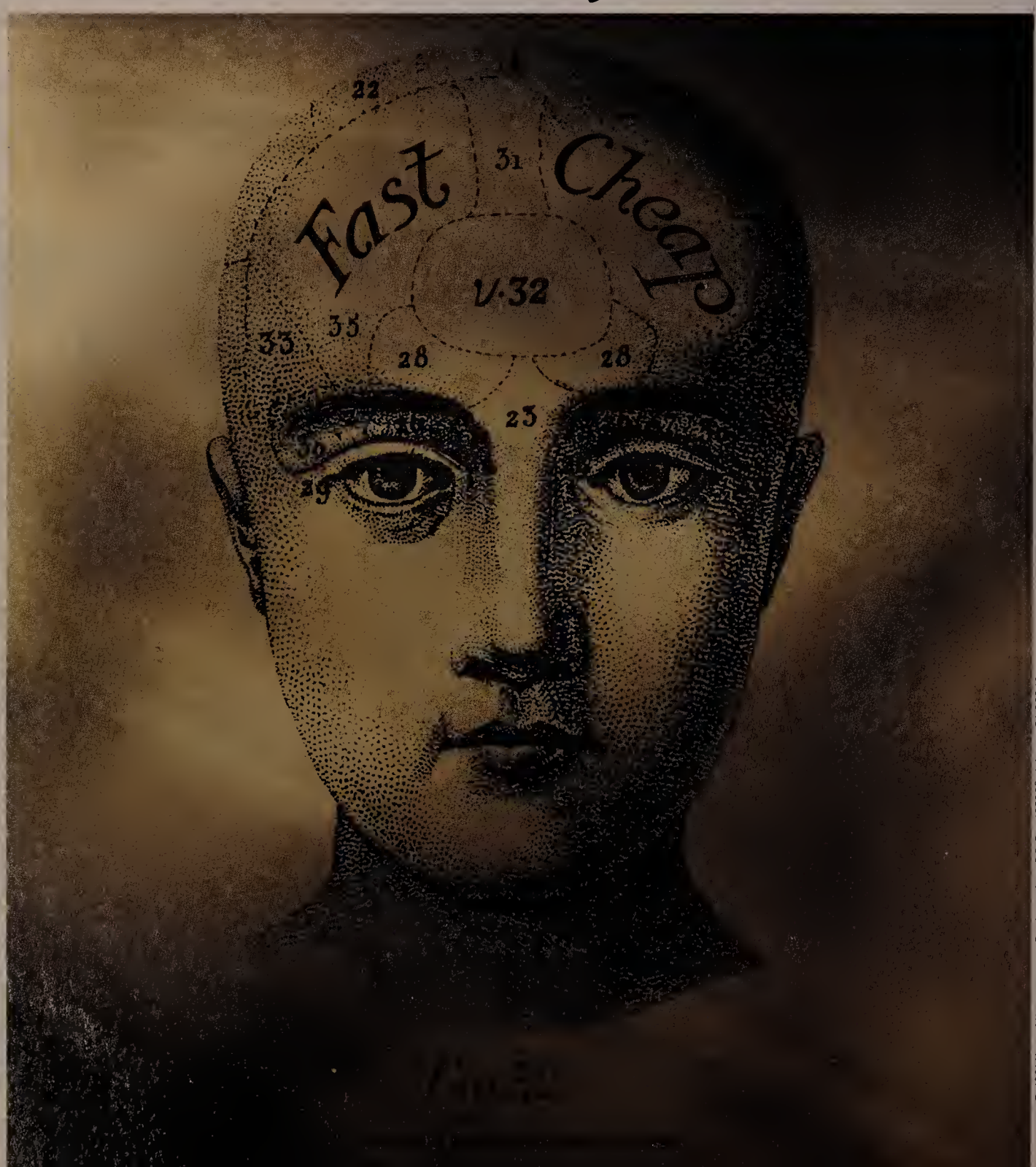


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# MANAGER'S FILE #8

## Software Site Licensing Checklist



*Alice LaPlante*

After a meeting on software site licenses held by the Corporate Association of Microcomputer Professionals (CAMP), director Julian Horwich reports, "It sounds like a boring topic, but the intensity of interest turned it into one of the most heated discussions we've ever had." The major complaints of the CAMP members were that software licenses are hard to understand, widely inconsistent among vendors, and difficult to enforce.

Actually, in the world of PCs, the term "site license" is a misnomer. Few, if any, off-the-shelf software packages can be licensed for *unlimited* use at a given site for a one-time fee. Instead, most site licenses are, in effect, volume discounts: A business agrees to buy a certain number of copies of a package at a price that is substantially less than the per-unit retail cost. One slight twist is that some vendors will allow "nonsimultaneous" use of licensed software, meaning employees can make a backup copy for use on their laptop or home computer.

But the real controversy over site licensing is in the local area network (LAN) arena. Most businesses with LANs are putting copies of software on a file server to be accessed by any LAN user. Because not every LAN user needs simultaneous access to the software, many managers prefer software licenses that measure *concurrent* use of a product. In other words, if there are 100 nodes on a LAN, but only 20 users will access a particular product at one time, managers don't want to pay for a 100-user license.

Then there is the problem of administering a LAN license: How can a manager be sure that the number of users doesn't exceed the terms of the license? Some software vendors provide a meter that counts the number of simultaneous users on a LAN and automatically locks out additional users when the limit has been reached. While this can be a helpful feature from an enforcement perspective, such metering software may be poorly designed and hard to use. A manager may already have a LAN meter in place, whether it's one of the many third-party metering packages available, such as *Saber Meter*, *SiteLock*, or *LANScope Resource Manager*, or it's built into the LAN operating system software.

The most helpful metering programs track usage statistics such as who is using an application and when, and who is being locked out. For any of these reasons, many managers like to have the option to turn off the software vendor's meter in order to substitute one of their own choice. Some software vendors may agree to this, but others may resist.

Being able to "unbundle" manuals is also an issue in LAN software licenses. Although the percentage of users on a LAN who access an application simultaneously may be low, even infrequent users may need a copy of the manual. Therefore, businesses should be able to buy additional copies of manuals, or copy existing manuals, without the vendor suspecting them of software piracy.

Unfortunately, although software vendors are aware of these issues—with many working with user groups to establish LAN licenses that are easier to understand and administer—the terms and conditions of such licenses still vary widely. As a result, PC managers need to examine each licensing policy to determine if it's right for their business.

*Alice LaPlante is a freelance writer in Palo Alto, California.*

**Saber Meter,** Saber Software Corp., 214/361-8086
**Reader service no. 601**

**SiteLock,** Brightwork Development, Inc., 800/552-9876
**Reader service no. 602**

**LANScope Resource Manager,** Connect Computer Company, 612/944-0181
**Reader service no. 603**

### Know What to Ask for in a Software License Agreement

- ✓ Make sure the license is cost-effective. You may get a better deal by buying multiple copies at a discount software house; the only advantage you may lose is clout with the vendor.
- ✓ Ask for "nonsimultaneous" use for employees' home or laptop PCs.
- ✓ Paying for *concurrent* use of software on a LAN server is preferable to paying for every node on the LAN.
- ✓ To ensure compliance with the license terms, the software should include a metering utility that tracks the number of users simultaneously accessing the software.
- ✓ Get permission to order additional copies of the software manuals or copy existing ones without enlarging the scope of the license.

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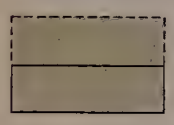
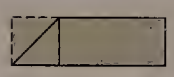
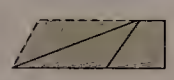


B. Fold back front corners.



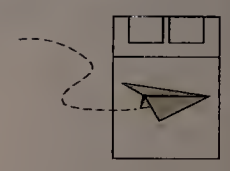
C. Make second fold on front corners.



D. Make a second lengthwise fold down.

E. Hold airplane up between thumb and forefinger.

F. Open a window. Toss.



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Take a look at a few of the features that will help ease your tax burden.

## Here's How Easy It Is:

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  Gets you up and running in less than an hour.
- **Tax Preparation Checklist**
  Reminds you of everything needed to prepare your return.
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  Forms, schedules & worksheets are linked and automatically updated when new data is entered.
- **Full Mouse Support**
- **Tax Forms & Category Locator**
  Quickly identifies which tax form relates to a specific tax category.
- **Tax Information Flow Chart**
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- **Depreciation History**

## Here's How Powerful It Is:

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  Graphically replicates all IRS-submittable forms & schedules on your laser or dot matrix printer. No additional software required.
- **Tax-Saving Tips & Year-End Strategies**
  More than 60 "Overlooked" Deductions. Plus money-saving advice on protecting your assets at tax time.
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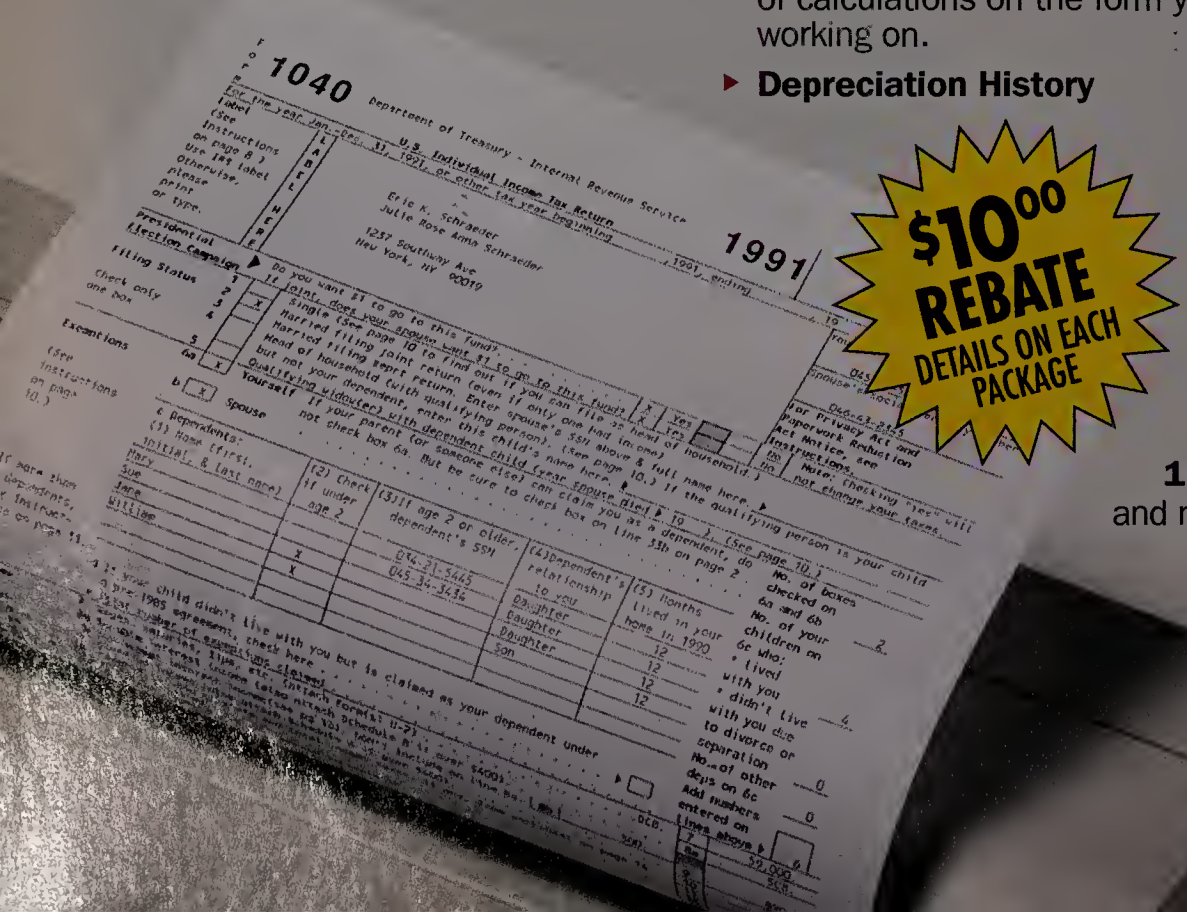
- **24 State Programs Available**
- **Reads Quicken, Lotus & Managing Your Money Files**
- **Print Multiple Tax Returns or Many Different Returns at One Time**

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BM & Compatible PC Users:

# A hard-driving offer on Ford's newest software

Presenting the 1992 Simulator for just $6.95...

IBM® & Compatible PC Users:

# Ford's newest model comes fully loaded with high-performance features.

## Introducing the 1992 Ford Simulator III.

**Explore the 1992 lineup of Ford cars and trucks.**

It's like walking into an exciting showroom, selecting the model of your choice and taking it for a spin. It's the 1992 version of the Ford Simulator, fully loaded with more data, enhanced EGA and VGA graphics and a simulation game that's better than ever before! In fact, it includes enough fascinating details to turn your showroom visit into a fact-finding event—right from the comfort of your home.

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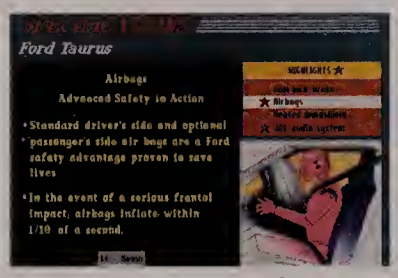
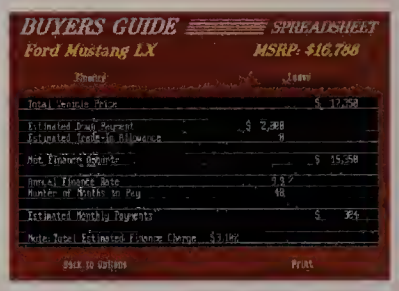



**Play an exciting, new driving game that challenges your skills.**

This year, the new simulation game is designed to put your steering, acceleration, gear shifting and braking skills to the test. (Depending on which computer you have, you can play the game with a mouse or a keyboard.)

You'll take a long—yet fast—trip up to "Lake Wakatonka." Along the way, you'll have to pass famous Wakatonkan landmarks...talk to stranded motorists...and encounter unexpected roadblocks. And make sure you watch for stop signs—or you may get a ticket.




**Calculate the retail price of the car that gets your heart racing.**

Once you select the right car or truck for you, the "Buyer's Guide" lets you choose from preferred option packages and individual options. Before you're done, you can even calculate monthly payments for financing and leasing. So when you decide to make your next vehicle purchase, you'll be able to make more informed decisions. It's an advantage you won't want to miss.

**"Kick the tires." "Look under the hood." And get the hard-driving facts.**

The Ford Simulator gives you in-depth information for all 1992 cars and light trucks produced by Ford Motor Company. From the Lincoln Continental to the Ford Explorer. For each car, you'll get basic model line information including manufacturer's suggested retail prices, passenger and cargo capacities, engines, transmissions and more.

As you can see, the Ford Simulator III really does come fully loaded. For only $6.95, it lets you get behind the wheel and explore all of 1992's models.

**So why not put yourself in the driver's seat—and order the Ford Simulator III today.**

**Call 1 800 322-1786,**
**Monday–Friday, 8:30 AM–6:00 PM, EST. Or return this card today.**

The Ford Simulator III requires an IBM or compatible PC with 640K RAM and EGA or VGA color graphics.

---

# Don't let the 1992 Ford Simulator III pass you by...

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**14310 Hamilton Avenue**
**Highland Park, MI 48203**

☐ Enclosed is my check or money order (made payable to Ford Simulator) for

$_____ for _____ Ford Simulator(s).

☐ Bill my ☐ VISA ☐ MasterCard

Card No.:

Exp. Date: _____

My disk drive size is ☐ 5¼" ☐ 3½"

My graphic board is ☐ EGA ☐ VGA

Signature: _____

Please allow 4 weeks for delivery. No foreign orders accepted.

Mr. Ms. Mrs. _____

Address _____

City State Zip

**We would appreciate learning some information about you and your vehicle:**

**1.** What vehicle are you presently driving?

Year Make Model

**2.** Do you plan to get your next new vehicle:
☐ Within 3 months ☐ 4-6 months ☐ 7-12 months
☐ 1-2 years ☐ No plans within 2 years

**3.** Will your next vehicle be a:
☐ car ☐ truck ☐ van

**4.** Do you have the capability to access information via a modem?
☐ Yes ☐ No

PW02

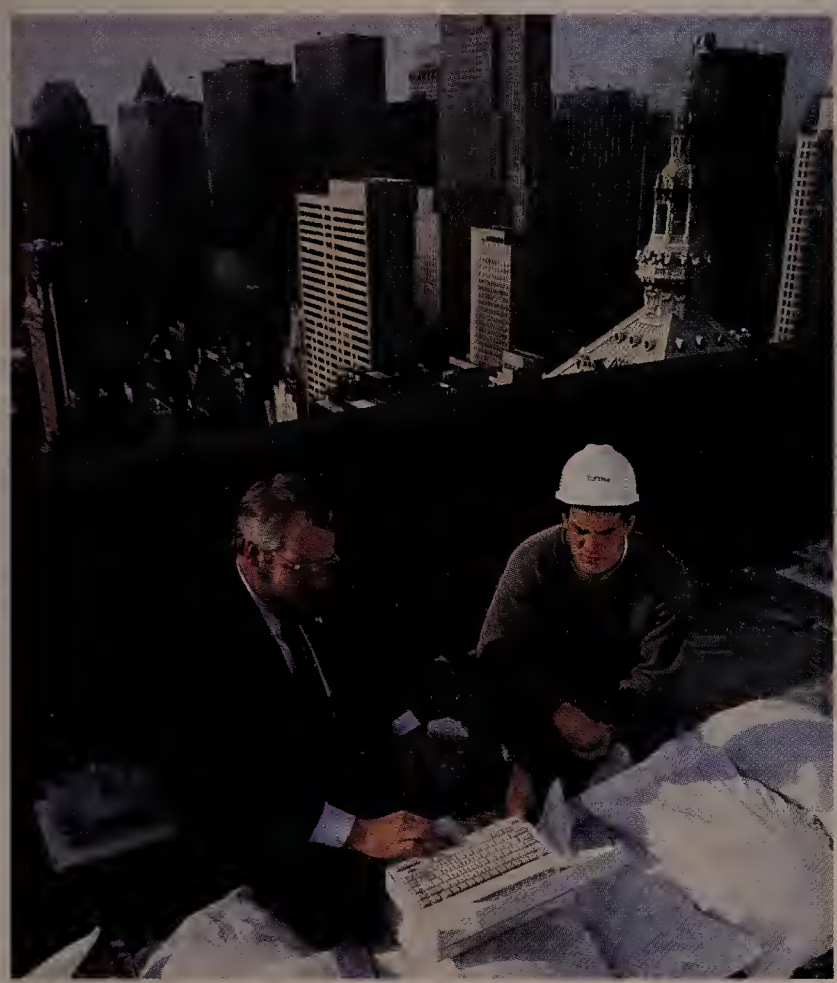
# Drive it home for just $6.95.

*Edited by* ERIC BENDER

**Price Tags Still Carry Premium Despite Cuts**

# Compaq Tries to Adjust to Leaner Times

*Users: Service and Support Remain Inconsistent*



**Turner's Dick Schell (left) has switched Compaq dealers half a dozen times but says the supplier is addressing the problems.**

JONATHAN LEVINE

As PCs become commodities, users grow ever more price-sensitive, more prone to shun traditional dealers, and more demanding of direct manufacturer support. That leaves Compaq Computer—with its history of premium pricing and dealer-only sales—playing catch-up with the clone makers.

The Houston, Texas, giant is losing sales among customers like Fritz Companies, a San Francisco transportation firm. Fritz relies on Compaq for network PCs but is switching to Dell for standalone models. "Unless a system is purchased specifically for the network," explains programmer analyst Verne Armstrong, "price is the number one driver."

Defections like these have stopped Compaq sales growth cold and slashed the company's profits. But lost sales have also triggered major initiatives, including more aggressive prices, broader distribution, improved dealer support, and better outreach programs, says CEO Rod Canion.

### Prices Fall, Outlets Broaden

Compaq cut prices last spring, and Canion says users aren't paying a premium for its products. Although many users disagree, a goodly number of them say that they are still willing to pay extra for Compaq systems because of their reputation for high quality and compatibility.

But they're not paying, as they once did, for a clear technology leader. "Today, Compaq is not able to bring out the first of anything," declares Thomas Yuen, cochair of rival AST Research in Irvine, California, summing up a general view. However, being first "isn't all-important," according to Dick Schell, information systems director for Turner Corporation, a $3 billion construction firm in New York. "We're more concerned with maintaining product quality."

### Beyond Dealer-Only Support

Compaq has retreated from its strict dealer-only distribution policies, recognizing the radical changes brought on by savvy customers, says Seymour Merrin, head of Merrin Information Services in Palo Alto, California. Compaq has expanded its marketing channel, selling through computer superstores like Tandy's Computer City while also increasing distribution through value-added resellers and high-end dealers.

Compaq also offers a direct service option, an innovation applauded by Turner's Schell, who has switched Compaq dealers half a dozen times. "We rely exclusively on PCs and networks, so getting responsive, qualified service is critical," says Schell. He contacts Compaq directly when dealers are stumped. "We don't go to Compaq to fix PC problems, though," he says. "We go to Compaq to fix dealers." Schell thinks that the service option and a new 800 number for users is proof that Compaq is trying to make its dealers more responsive.

Most users say Compaq is reading their needs correctly. "I wish they were moving more quickly," says Colby Springer, vice president of information systems at Pearle Vision in Dallas. "But they recognize the problems, and in the long term they'll be wherever we need them to be."

—*Kathleen A. Gow*

## What Users Say About Compaq

***From PC World interviews***

**Overall satisfaction**
High—products solidly engineered and compatible with other vendors' equipment.

**Support**
Mixed—some users give dealer support rave reviews, others switch dealers and call Compaq with problems.

**Pricing**
Still high in spite of cuts; some customers are turning to other vendors for all but high-end systems.

**Leadership**
Compaq is no longer seen as the technology leader, but most users say the change doesn't bother them.

**Contact with vendor**
Users want more across the board, and better access to technical information. Small businesses say they're being overlooked.

# Client-Server Data Bases: Still Promising

## *Faster PCs Minimize Advantages, Some Users Say*

Software delays, technical difficulties, and high implementation costs have slowed the march toward client-server computing—but those barriers are teetering.

Few argue with the concept behind client-server technology. Built around Structured Query Language (SQL) data bases, the technology promises to improve network performance and reduce LAN traffic by off-loading chores from PCs to high-powered network servers. The technology will enable corporate users to access mainframe and minicomputer data through familiar DOS front-end applications, while powerful back-end software like Microsoft's *SQL Server* does the heavy lifting in between. Administrators will be able to improve control of information resources by centralizing data base management on the server.

**SOLON Consulting's Keith Mitchell found it cheaper to buy 486 PCs than to make the big jump to a client-server data base.**

### Software Served—But Slowly

Software delays were the first holdup. But server software from Microsoft, Oracle, and other major suppliers has been available for many months, and some client packages have hit the market, ranging from *dBASE* to fancy *Windows* front ends with at least minimal SQL support. Nonetheless, the building and optimizing of client-server systems remained a formidable challenge to in-house developers.

Shifting marketing strategies further hurt acceptance of client-server. When Microsoft tied *SQL Server* to OS/2 and then OS/2 fizzled, it became nearly impossible for *SQL Server* to establish itself as a server standard. Without a standard, would-be customers were left guessing.

Market-leading NetWare, meanwhile, proved an inhospitable environment for client-server computing, notes Patrick Beahan, senior PC systems specialist at Arco Oil and Gas in Dallas. The NetWare enhancements necessary to support *SQL Server* didn't appear until a year ago.

### Simpler Speed Boost: Fast PCs

When the software finally arrived, the economics had changed. A few years ago it seemed important to make high-priced 386 and 486 servers carry their fair share of the processing load, and an investment in SQL software seemed a small price to pay. But yesteryear's $15,000 486 file server is today's $5000 workstation, and network administrators aren't nearly as concerned about wringing processing out of a server.

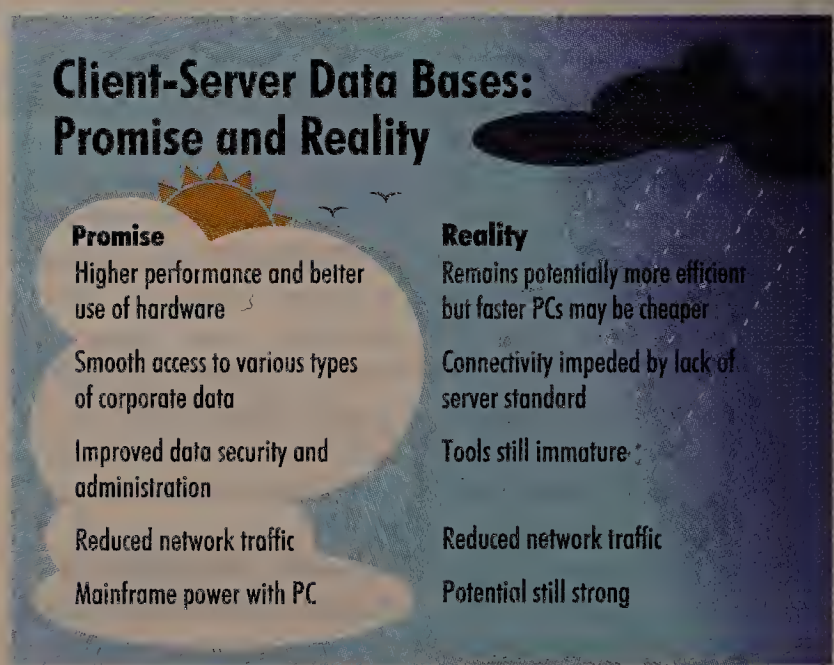
*SQL Server* costs $7995 for an unlimited user license. A 20-user license for *dBASE IV Server Edition* front end runs another $7995. Together that price is nearly triple what *dBASE IV LAN Pack* would cost, without adding extra programming expenses.

"You can pretty much replicate the promise of client-server by putting some expensive and powerful machines to work," says Keith Mitchell, vice president of operations for SOLON Consulting Group in Silver Spring, Maryland. Solon considered switching to client-server but didn't because of the up-front cost. Now Mitchell processes data bases of up to 1 million records with 486 machines and traditional data base programs rather than a client-server setup.

Faced with adopting OS/2, switching LAN operating systems, restructuring their data bases, and learning the arcane tricks of SQL, most users opted out. "For small jobs you don't really need client-server with all the extra expense and technology," says Russell Freeland, president of Synergy Corporation in Fort Lauderdale, Florida.

The immediate future lies more in "downsizing" software from mainframes and minicomputers than in moving applications up from PCs. "We're seeing an awful lot of systems come down off mainframes," reports David Litwack, senior vice president for development at Powersoft in Burlington, Massachusetts.

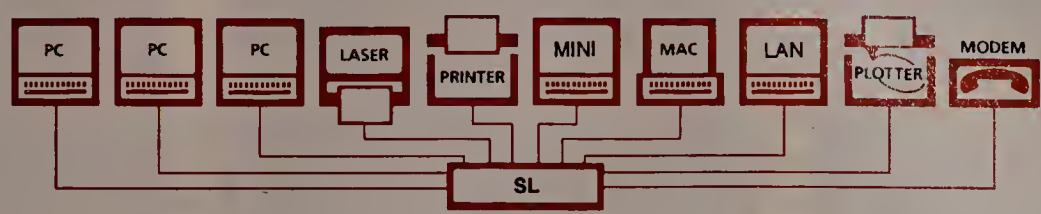
And with the technical barriers falling, corporate customers like Arco, which once dropped the concept, are interested again in client-server. "In the next year or two," says Beahan, "it's going to take off big." —*Mark Henricks*

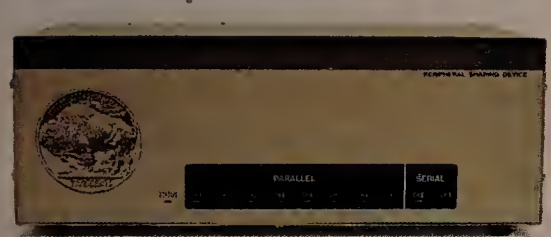



**Client-server technology has not yet revolutionized PC data bases as expected, but the concept should pay off over time.**

KATHERINE LAMBERT

# Big Business Productivity For Small Workgroups





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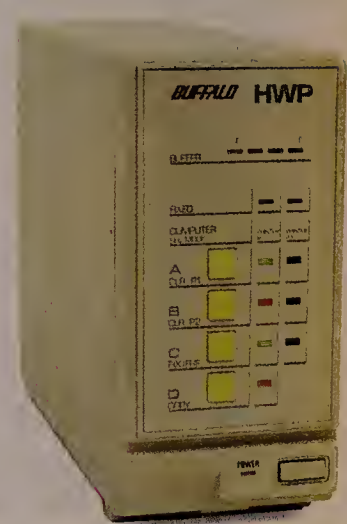


# Printer Sharing Solutions

| Model Name | Total Ports | PCs/ Printers | Memory Available | Printer Selection | Price $ / Buffer |
|---|---|---|---|---|---|
| SL | 10<br>6 Ser., 4 Par. | Any Combination | 256KB - 4MB | Pop-up Menu | $495 / 256KB<br>$595 / 1MB |
| SLP | 10<br>8 Par., 2 Ser. | Any Combination | 256KB - 4MB | Pop-up Menu | $495 / 256KB<br>$595 / 1MB |
| HXM | 4<br>2 Ser., 2 Par. | Any Combination | 256KB - 16MB | Pop-up or Buttons | $295 / 256KB<br>$395 / 1MB |
| HXS | 4<br>Serial | Any Combination | 256KB - 16MB | Pop-up or Buttons | $295 / 256KB<br>$395 / 1MB |
| HWP | 5<br>Parallel | 3/2<br>4/1 | 256KB - 16MB | Pop-up or Buttons | $295 / 256KB<br>$395 / 1MB |
| HXP | 4<br>Parallel | 2/2<br>3/1 | 256KB - 16MB | Pop-up or Buttons | $245 / 256KB<br>$345 / 1MB |
| HCP | 2<br>Parallel | 1/1 | 256KB - 16MB | One Printer | $225 / 256KB<br>$325 / 1MB |
| AS-41 | 5 Parallel | 4/1 | None | One Printer | $195 |
| AS-31 | 4 Parallel | 3/1 | None | One Printer | $175 |

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Circle 215 on reader service card

# Wireless Networks Find Their Niche

## *New Products Allow New Flexibility for Installations*

The United States is wired into local area networks, and the number of installations is growing by about 50 percent a year. But advances in wireless networking mean your work group can be connected without being bound.

Still in its infancy, wireless media is being adopted mostly by users whose network layout changes frequently or whose workplace is difficult to wire. But technical enhancements and significant price drops make a network without wires cost-competitive with nets using the popular unshielded twisted-pair (UTP) cables—and they're often much easier to install or modify.

Radio wave–based systems like Motorola's Wireless In-building Network (WIN) and NCR's WaveLAN generally match the effective 1.5-Mbps to 3.3-Mbps data transfer rates of wired ethernet nets. These systems can transmit data around corners and through office walls and partitions, but not through ceilings and floors.

NCR's WaveLAN emits low-frequency (925-MHz) radio waves that spread out over a wider spectrum to ensure data security and avoid interference from other radio devices. Motorola solves that problem by transmitting WIN's signals at 18 GHz, far above the range other devices use.

Each WIN control module can communicate with up to 32 ethernet workstations by relaying the signal through strategically placed user modules (connected via a thin wire to an ethernet card in each PC). Jim Scott, systems analyst at Boeing Computer Services in Bellevue, Washington, supports one WIN user who sits 55 feet and five office walls away from the control module. WaveLAN's station-to-station design provides even broader coverage. Either system is adequate for most work-group situations, and WIN enjoys a definite price edge.

A 10-station WIN network might cost as little as $5985, compared with $7500 for a typical wired ethernet network (including $250 for each PC adapter) and $13,900 for 10 of the antenna/adapter combinations that NCR sells. Expand that LAN to 18 stations and the cost differential favors the WIN system even more—$11,490, compared with $18,000 for UTP and $25,020 for WaveLAN.

### Work-group LANs: The Moving Story

*Estimated hardware installation costs for 10 nodes*

| Wireless In-building Network | | WaveLAN | 10Base-T |
|---|---|---|---|
| 1 control module | $3995 | 10 connections | 10 connections |
| 2 user modules | $1990 | @ $1390 each | @ $750 each |
| Total | $5985 | $13,900 | $7500 |

*Total cost after moving each node once*

| Wireless In-building Network | | WaveLAN | 10Base-T |
|---|---|---|---|
| Total | $5985 | $13,900 | $10,500 |

*Sources: Motorola, NCR, Peat Marwick*

**Wireless LANs make sense for work groups that move often. Moving a wired LAN such as 10Base-T costs about $300 per node.**

### Opening Up New LANs

Moreover, a Peat Marwick study found that 30 to 50 percent of the users on a typical LAN relocate annually. In fact, says Bill Johnson, a senior partner in Chicago, it's not uncommon for an entire LAN-connected work group to move once or even twice a year.

That's more true for some work groups than others, says Richard Shankle, telecommunications associate at Dow Chemical in Houston, Texas. Dow is trying out small wireless LAN installations for R&D and other work groups whose members come together for a short period of time.

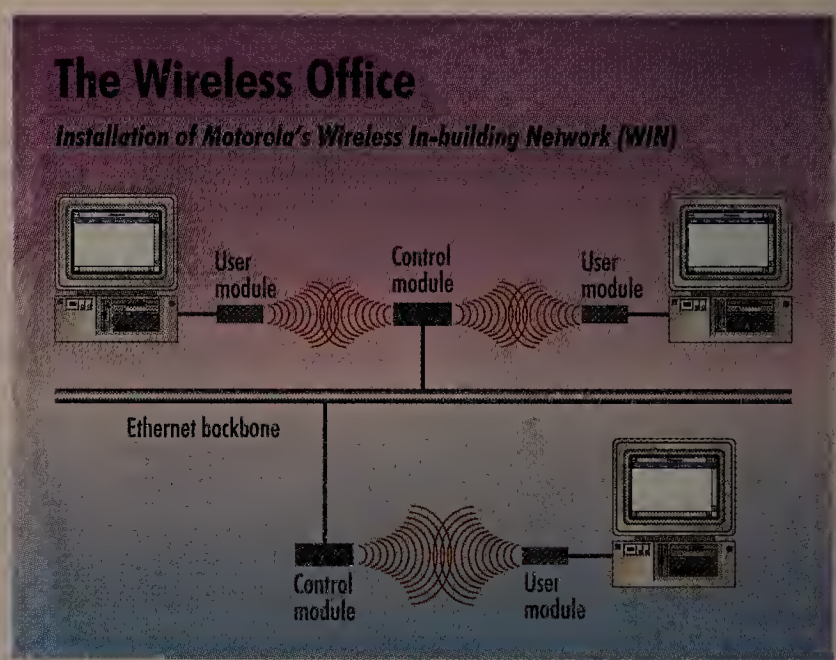
Moving a wired net costs an average of $300 per node, says Peat Marwick's Johnson, and that does not reflect productivity lost to downtime. Both kinds of expense are big issues with Boeing's Scott, whose company has 45,000 wired ethernet nodes and constant movement of workers and equipment. "Often, the biggest problem is having wire pulled in. It takes 60 to 90 days," says Scott. Boeing spends millions every year on wiring and encounters many problems with wire, including security and electrical interference.

Wireless nets have not brought new operational problems, says Scott. "One of the things that impressed me most is that I didn't have to load software, or go in and flip switches, or get out the Elmer's glue," he says. "It's completely plug and play."

NCR WaveLAN product manager Daryl Maddox looks forward to industrywide sales of 100,000 units next year. That figure pales in comparison with the 10 million LAN nodes expected to be installed worldwide, but NCR considers wireless connections a strategic direction for all types of communications. Whether the devices are cellular phones and data modems or pen-based PCs and notebooks that plug in to more robust network servers via radio, says Maddox, wireless systems will connect you without tying you down.

—*Mike Hogan*

*Kathleen A. Gow is a freelance writer in Medford, Massachusetts; Mark Henricks is a* PC World *contributing editor in New York.*




**In wireless networks each PC's network adapter connects to a user module that communicates via radio waves with a control module.**

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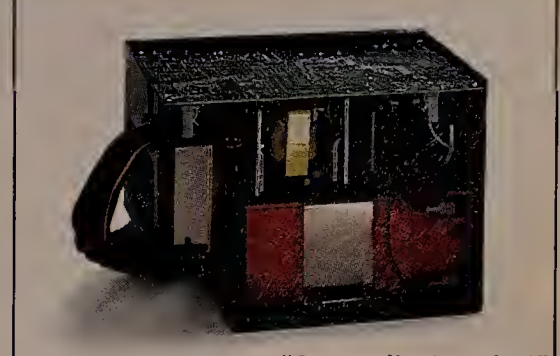

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**The Gateway 2000 33-MHz 386VGA and Dell System 320LT were the most aggressively priced desktop and portable PCs in the latest survey by International Data Corporation.**

## Best-Sellers

*Leading PCs sold through traditional computer channels*

1. *IBM PS/2 Model 55 SX*
2. *IBM PS/2 Model 70 (20 MHz)*
3. *Compaq LTE 386s/20*
4. *Compaq Deskpro 386/20e*
5. *IBM PS/2 Model 30-286*
6. *Compaq Deskpro 386s*
7. *NEC PowerMate SX, SX/20*
8. *Compaq Deskpro 386s/20*
9. *Compaq Deskpro 386n*
10. *Compaq LTE/286*

**IBM's Model 55 SX and Model 70 continue to lead sales through the dealer channel, but Compaq holds six of the top positions, according to Storeboard/Computer Intelligence's survey.**

## BARGAINS OF THE MONTH

## Over the Counter

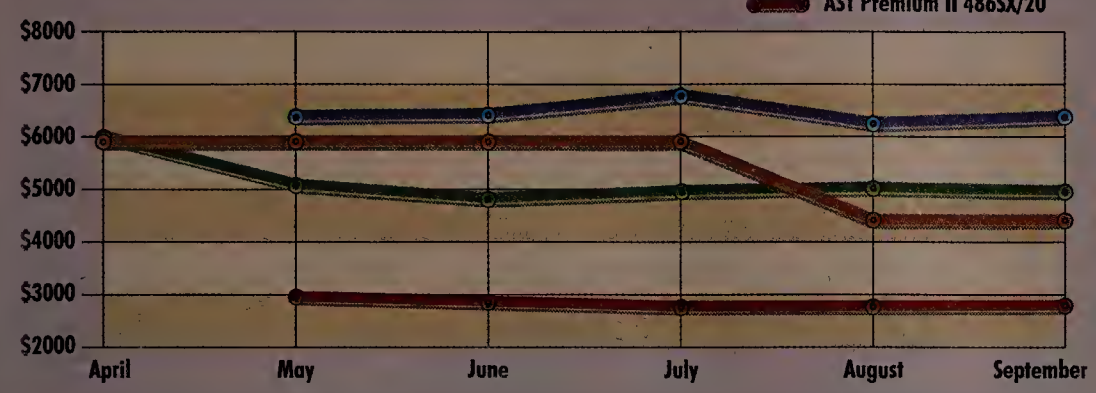
*What you pay at retail stores for popular PCs*

| | Configuration | | | | National | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Speed (MHz) | RAM (MB) | Hard disk (MB) | Video adapter | List | Average | Boston | Chicago | Dallas/Ft. Worth |
| **80386SX-based desktop PCs** | | | | | | | | | |
| AST Bravo 386SX/20 | 20 | 2 | 40 | VGA | $1695 | $1418 | $1568 | $1293 | $1281 |
| Compaq Deskpro 386s | 16 | 2 | 40 | VGA | $2299 | $1837 | $1889 | $1931 | $1686 |
| Compaq Deskpro 386s/20 | 20 | 2 | 60 | VGA | $2599 | $2073 | $2138 | $2190 | $1906 |
| Dell System 320 SX | 20 | 2 | 40 | VGA | $1400 | $1400 | $1400 | $1400 | $1400 |
| IBM PS/2 35 SX-043 | 20 | 2 | 40 | VGA | $2525 | $1918 | $1937 | $1916 | $1936 |
| IBM PS/2 55-041 | 16 | 4 | 40 | VGA | $2745 | $2034 | $2114 | $1979 | $2085 |
| NEC PowerMate SX/20 | 20 | 2 | 42 | none | $2199 | $1688 | $1682 | $1722 | $1590 |
| **80386DX-based desktop PCs** | | | | | | | | | |
| AST Premium 386/25 | 25 | 2 | 110 | VGA | $5595 | $4119 | $4252 | $4233 | $3720 |
| Compaq Deskpro 386/33L | 33 | 4 | 120 | VGA | $6199 | $4945 | $5088 | $5039 | $4546 |
| Dell System 333P | 33 | 4 | 100 | VGA | $2400 | $2400 | $2400 | $2400 | $2400 |
| Epson Equity 386/25 Plus | 25 | 2 | 100 | VGA | $3199 | $2486 | $2722 | $2598 | $2341 |
| Gateway 2000 33-MHz 386VGA | 33 | 4 | 200 | VGA | $2320 | $2320 | $2320 | $2320 | $2320 |
| IBM PS/2 Model 70-A16 | 25 | 4 | 160 | VGA | $6445 | $4825 | $4963 | $4746 | $4930 |
| Tandy 4033 LX | 33 | 2 | 105 | VGA | $4398 | $4398 | $4398 | $4398 | $4398 |
| **80486SX-based desktop PCs** | | | | | | | | | |
| ALR BusinessVEISA | 20 | 5 | 120 | none | $4295 | $3361 | $3502 | $3107 | $3307 |
| AST Premium II 486SX/20 | 20 | 4 | 80 | VGA | $3495 | $2761 | $2754 | $2665 | $2669 |
| IBM PS/2 Model 90XP-OG5 | 20 | 4 | 80 | XGA | $8345 | $6370 | $6426 | $6496 | $6378 |
| **80486DX-based desktop PCs** | | | | | | | | | |
| AST Premium 486/25E | 25 | 4 | 110 | VGA | $8595 | $6407 | $6532 | $6560 | $6078 |
| Compaq Deskpro 486/33L | 33 | 4 | 120 | VGA | $8999 | $7142 | $7399 | $7282 | $6599 |
| IBM PS/2 Model 95 XP | 33 | 4 | 320 | XGA | $16,445 | $12,308 | $12,827 | $12,168 | $12,563 |
| NEC PowerMate 486/25E | 25 | 4 | 140 | none | $7399 | $5601 | $5821 | $5457 | $5352 |
| **Portables/laptops** | | | | | | | | | |
| AST Premium Exec 386SX/20 | 20 | 2 | 40 | VGA-LCD | $3395 | $2657 | $2761 | $2713 | $2669 |
| Compaq LTE/286 | 12 | 640K | 20 | CGA-LCD | $1949 | $1564 | $1607 | $1626 | $1429 |
| Compaq LTE 386s/20 | 20 | 2 | 30 | VGA-LCD | $4399 | $3499 | $3618 | $3656 | $3226 |
| Dell System 320LT | 20 | 2 | 40 | VGA-LCD | $1999 | $1999 | $1999 | $1999 | $1999 |
| IBM PS/2 Model L40 SX | 20 | 2 | 60 | VGA-LCD | $5245 | $3914 | $4039 | $3884 | $4010 |
| NEC UltraLite 286F | 12 | 1 | 20 | CGA-LCD | $2199 | $1702 | $1754 | $1686 | $1630 |
| TI TravelMate 2000 | 12 | 1 | 20 | VGA-LCD | $2369 | $1697 | $1726 | $1810 | $1582 |
| Toshiba T1200XE | 12 | 1 | 20 | CGA-LCD | $1999 | $1640 | $1724 | $1619 | $1674 |
| Toshiba T2000SX | 16 | 1 | 40 | VGA-LCD | $3749 | $2942 | $3120 | $2954 | $2924 |

From an IDC survey of more than 180 computer dealers in eight metropolitan areas. Figures based on at least four price quotes for each machine. Prices are based on manufacturer's standard configuration without monitor.

## Trend Line: 386/33 vs. 486SX Desktops

*National average street price for selected models over six months*




**While many expected the 486SX systems that debuted last spring to place severe pricing pressure on 33-MHz 386 models, IDC's surveys don't necessarily reflect such a trend. The price of Compaq's 386/33L dropped in April (along with those of the rest of the vendor's line) but held steady afterward. Tandy waited until August to adjust its pricing. Meanwhile, costs of 486SX machines held moderately steady.**

politan

| Los Angeles | Miami/ Ft. Lauderdale | New York | San Francisco Bay Area | Washington, D.C. |
|---|---|---|---|---|
| $1341 | $1419 | $1471 | $1553 | $1404 |
| $1784 | $1878 | $1925 | $1834 | $1858 |
| $2026 | $2123 | $2092 | $2073 | $2099 |
| $1400 | $1400 | $1400 | $1400 | $1400 |
| $1944 | $1902 | $1948 | $1878 | $1915 |
| $2067 | $1919 | $2108 | $1989 | $2007 |
| $1686 | $1761 | $1677 | $1491 | $1732 |

| | | | | |
|---|---|---|---|---|
| $4193 | $3991 | $4330 | $3906 | $3955 |
| $4803 | $5065 | $5182 | $5161 | $4942 |
| $2400 | $2400 | $2400 | $2400 | $2400 |
| $2346 | $2459 | $2673 | $2399 | $2463 |
| $2320 | $2320 | $2320 | $2320 | $2320 |
| $4963 | $4786 | $4877 | $4666 | $4738 |
| $4398 | $4398 | $4398 | $4398 | $4398 |

| | | | | |
|---|---|---|---|---|
| $3415 | $3436 | $3311 | $3376 | $3454 |
| $2742 | $2921 | $2746 | $2920 | $2720 |
| $6426 | $6313 | $6325 | $6194 | $6546 |

| | | | | |
|---|---|---|---|---|
| $6446 | $6189 | $6652 | $5969 | $6051 |
| $6990 | $7413 | $7409 | $7261 | $7213 |
| $11,973 | $11,985 | $12,537 | $11,289 | $12,944 |
| $5549 | $5771 | $5320 | $5424 | $5716 |

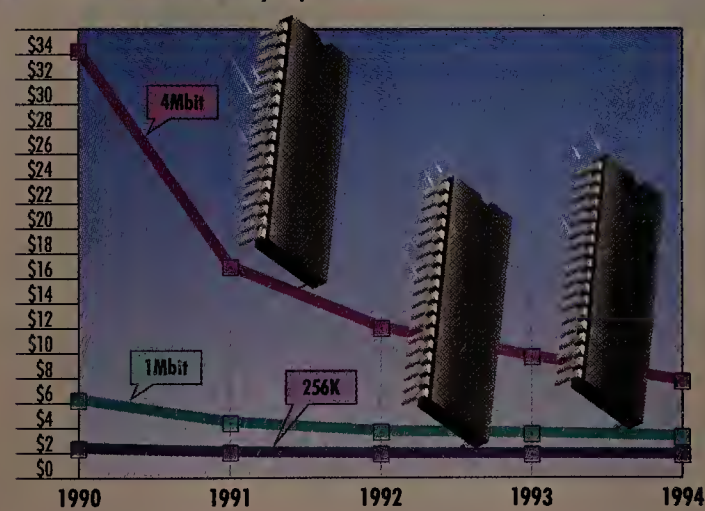
| | | | | |
|---|---|---|---|---|
| $2559 | $2597 | $2562 | $2672 | $2541 |
| $1533 | $1591 | $1679 | $1557 | $1553 |
| $3390 | $3594 | $3619 | $3469 | $3546 |
| $1999 | $1999 | $1999 | $1999 | $1999 |
| $4039 | $4013 | $3796 | $3686 | $3868 |
| $1686 | $1702 | $1597 | $1730 | $1709 |
| $1657 | $1836 | $1864 | $1857 | $1490 |
| $1628 | $1653 | $1567 | $1721 | $1642 |
| $2915 | $2872 | $2865 | $2980 | $2933 |

## PC Futures: Prices Poised for a Drop

Overall, costs keep drifting down—for example, prices dropped on every notebook and laptop PC in this survey. Price leaders like AST, Dell, and Gateway continue to tighten their belts, and the combination of flat U.S. sales and traditional fourth-quarter market free-for-alls should produce plenty of bargains in the next month or two. The Gateway 2000 33-MHz 386VGA and Dell System 320LT were the most aggressively priced desktop and portable PCs in IDC's latest survey.[1] IBM's two-year-old PS/2 Model 55 SX and three-year-old 20-MHz PS/2 Model 70 still top the best-seller list. Early next year, systems based on new CPUs from AMD, Chips & Technologies, and Intel should further boost price/performance. Memory costs also continue to drop, although not at a breakneck pace. Even high-end 4-megabit chips are in high-volume production and feeling the squeeze from slow market conditions.

## Memory: Falling Less Rapidly

*Vendor costs of DRAM memory chips in dollars*




**Except for 4-megabit models, prices on standard memory chips are no longer plummeting. The market is dominated by 1-megabit chips; Instat expects 867.5 million to ship worldwide this year. Deliveries of 4-megabit chips will soon surpass those of 256K chips.**

[1] Bargains of the Month are determined by adjusting prices on PCs of a given class for standard memory and storage, then finding which PC compares best.

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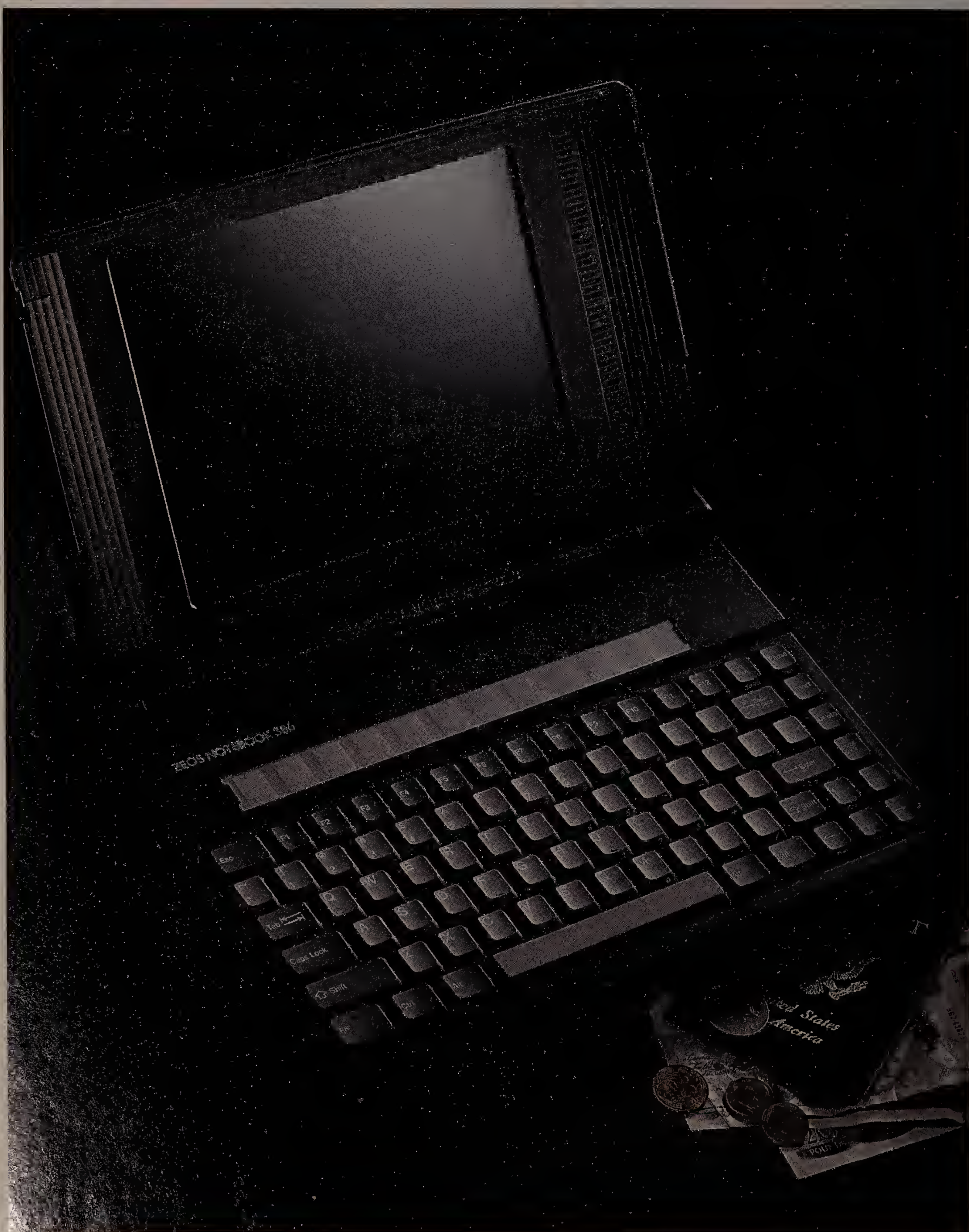

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# 50-MHz 486s Push To the Limit—and Beyond

*Systems based on Intel's racehorse chip burst from the starting gate, only to be reined in as the chip maker stumbles on technical problems.*

**If this won't make Windows run right, nothing will! Dell is one of the first system vendors to blast off with a 50-MHz 486. But for the moment Intel's chip is literally too hot to handle.**

*Michael Goodwin*

Yes, Intel is raising the stakes again with a new, faster chip: the top-of-the-line 50-MHz 80486. This time the performance handicappers have it easy because its 50-MHz clock means no other chip—not even AMD's impressive 386/40—can deliver comparable throughput. And major vendors such as Acer, ALR, Compaq, Dell, and Everex have already announced 50-MHz systems, as have a host of smaller manufacturers.

Despite the predictable marketplace chaos that accompanies the emergence of any new processing platform—not to mention the extra confusion caused by Intel's temporary halt in manufacturing because of chip overheating problems—the 486/50 offers exciting performance gains.

Not everyone needs a machine this fast or has the budget to buy one. But there have always been a few businesses where mission-critical applications like CAD/CAM or huge spreadsheets are so demanding that every last tweak of performance translates into profit. With the expanding popularity of *Windows*, that group now includes quite a few "ordinary" business users. For all these folks, 50 MHz is a likely next step.

### Beating the Clock

Architecturally the new chip is identical to the familiar 486/33, complete with built-in math coprocessor, but the execution is slightly different. Designed with .8 microns between etch lines (instead of the traditional 1.0 micron spacing), the new chip can run a bit faster since signals don't have as far to travel. The closer lines may make the chip run hotter, too—but this temperature differential is slight compared to the heat generated by the faster clock. Because of the cutting edge technology involved, only one Intel plant is currently capable of manufacturing the 50-MHz chip. Fortunately this chip factory is one of the largest and most modern plants that Intel oper-

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**50-MHz 80486 Systems**

These top-end speedsters are the last word in speed—assuming Intel can beat the heat.

**KEY FEATURES**

- **33 percent faster on CPU-intensive applications (preliminary test)**
- **10 percent faster on disk-intensive applications (preliminary test)**

**AVAILABILITY**

Fourth-quarter 1991

**PRICING**

$2995 (Atranics ATI 486/50) to $22,249 (AcerFrame 3000), depending on configuration

## 50-MHz Front-Runners

*These hot PCs are not only the fastest in performance, they are also the fastest out of the gate.*

| Model | List price[1] | EISA | SCSI | External cache (K) | CPU upgrade | Fast-RAM capacity | Bays | Compact footprint | Warranty (months) | On-site service |
|---|---|---|---|---|---|---|---|---|---|---|
| AcerPower 500 | $10,348[2] | Y | Y | 256 | N | 256MB | 4 | Y | 24 | Y |
| AcerFrame 1000 (server) | $13,159 | Y | Y | 256 | N | 128MB | 7 | N | 24 | Y |
| AcerFrame 3000 (twin-tower server) | $22,249[3] | Y | Y | 256 | N | 128MB | 8 | N | 24 | Y |
| ALR BusinessVEISA Array 486/50 | $10,394[4] | Y | N | 64–256 | Y | 49MB | 4 | Y | 12 | Y |
| ALR PowerPro Array 486/50 VM 420 | $13,964[4] | Y | N | 64–256 | Y | 49MB | 9 | N | 12 | Y |
| ALR BusinessStation 486/50 Model 200-DMA | $7144 | Y | N | 64–256 | Y | 33MB | 3 | Y | 12 | Y |
| Atronics ATI 486/50 | $2995 | N | N | 256 | Y | 64MB | 5 | Y | 12 | Y |
| Austin 486/50 | $5690 | Y | Y | 128 | N | 64MB | 8 | N | 12 | Y |
| Compaq Deskpro 486/50L Model 120 | $12,597[5] | Y | N | 256 | N | 104MB | 7 | N | 12 | N |
| CUI Advantage 486-50CX | $4400 | N | N | 64–256 | N | 64MB | 10 | N | 12 | Y |
| Dell PowerLine 450DE | $7299 | Y | Y | 128 | Y | 48MB | 5 | Y | 12 | Y |
| Dell PowerLine 450SE | $9299 | Y | Y | 128 | Y | 128MB | 11 | N | 12 | Y |
| Dolch 486-50E Portable | $16,995[6] | Y | Y | 128 | N | 32MB | 3 | n/a | 12 | Y |
| Everex Step Megacube 486/50 | tba | Y | N | 256 | N | 64MB | 8 | N | 12 | Y |
| Everex Tempo Modular Series 486/50ms | tba | N | N | 256 | Y | 32MB | 3 | Y | 12 | Y |
| Lightning 486/50 | $3395 | N | Y | 128–256 | N | 32MB | 5 | Y | 12 | Y |
| Lightning 486/50E | $4295 | Y | Y | 128–256 | N | 64MB | 5 | Y | 12 | Y |
| Mitac 4280i | $9070 | Y | N | 256 | N | 64MB | 7 | N | 12 | Y |
| Wang EC 461/50C | $14,590 | Y | N | 256 | Y | 64MB | 4 | Y | 12 | Y |

[1] Except where noted, price is based on 4MB to 5MB RAM, 100MB to 200MB drive, one floppy, VGA, and color monitor.
[2] With 338MB SCSI drive.
[3] Tentative price.
[4] Twin 210MB drives.
[5] With 8MB RAM.
[6] With 8MB RAM, plasma display.

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ates. That means once the silicon giant resumes full production, the 80486/50 CPU should be available in plentiful supply.

Because the chip's architecture is the same as that of the 486/33, systems engineers don't face any serious design problems in bringing new PCs to market, which should help keep prices from going through the roof. Several engineers told *PC World* the only significant design issue is to make slight modifications in the memory cache architecture in order to support the increased speed. Most suppliers simply use Intel's cache module, which is designed to run at 50 MHz; Dell and others have found that it is more cost-effective to design their own 50-MHz memory caches. Introducing wait states when accessing memory is a cheaper alternative, but it clobbers throughput—and when the purpose of the chip is to *boost* performance, it's inappropriate to hobble throughput.

While the 486/50 clock

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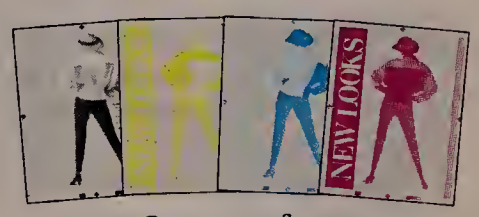


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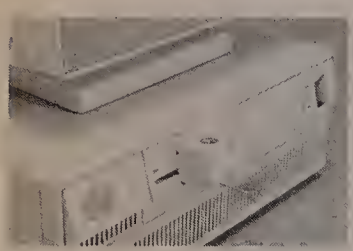

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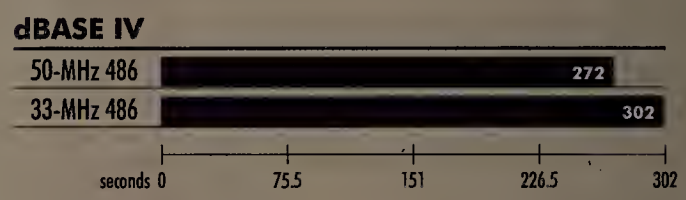
speed is almost 50 percent faster than the 33-MHz 486, real system performance gains will be a bit more modest. Preliminary benchmarks on two similar machines from the same major vendor (a 486/33 and a 486/50) show the 50-MHz system racing through the processor-intensive *1-2-3* benchmark about 33 percent faster. On disk-intensive applications such as *dBASE IV* and *Windows*, the increase was only 10 percent.

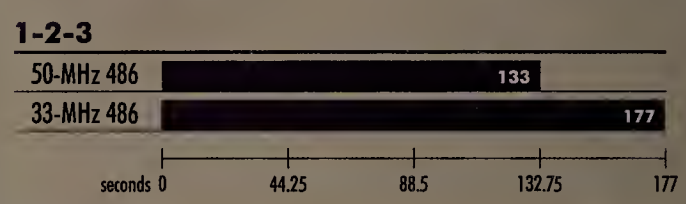
Some of these machines stick with the veteran ISA bus, but most boast EISA slots. Unless you're planning to max out the I/O bus by connecting your PC to a huge number of high-speed peripherals or

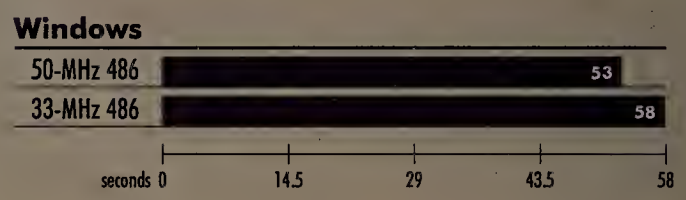
## TEST REPORT

### Vroom! PCs Hit 50 MHz

*You can't find faster 486s than the new 50-MHz models—CPU-intensive applications run about 33 percent faster than on 33-MHz units.*




**Methodology**
This preliminary performance test compares a prerelease 50-MHz 486 system from a major vendor with a similiar 33-MHz 486 from the same manufacturer.

**dBASE IV 1.1**
With the caching feature enabled, we complete an unindexed search for a single record in a 100,000-record parts table. Then we index the table, run the transaction processing module, and post 600 records.

**1-2-3**
We load the application, followed by three separate worksheets (arithmetic, financial, and scientific). We make various changes and run recalcs on each. Finally, we use the *MAPS* add-in from Management Advisory Services of Seattle to run a number of financial forecasts.

**Windows 3.0**
Timing begins and ends at the DOS prompt. We launch *Windows* along with a macro that loads *Microsoft Excel* with a financial worksheet and initiates a recalc. Then the macro loads Lotus's *Ami Pro* along with a 50K document that contains a 500K TIFF image. Finally, the macro launches *Micrografx Designer*, opens a drawing, displays it on screen, and exits to DOS.

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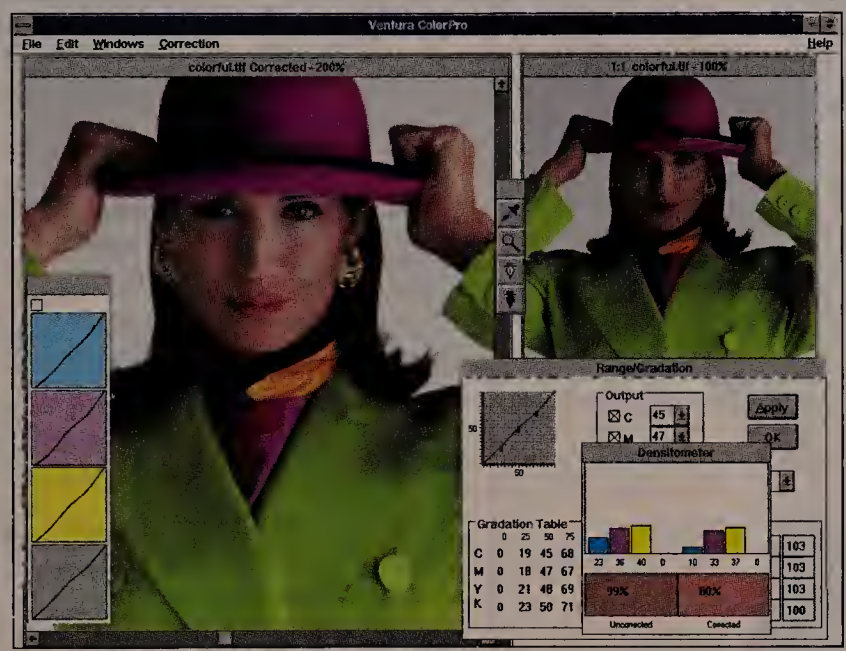


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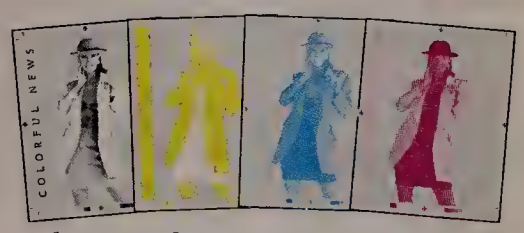


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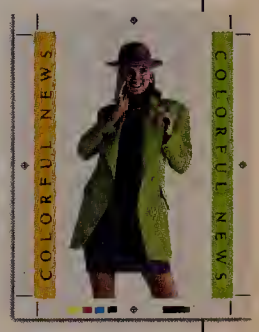


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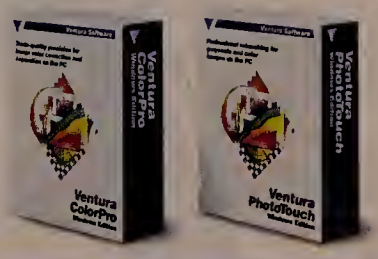


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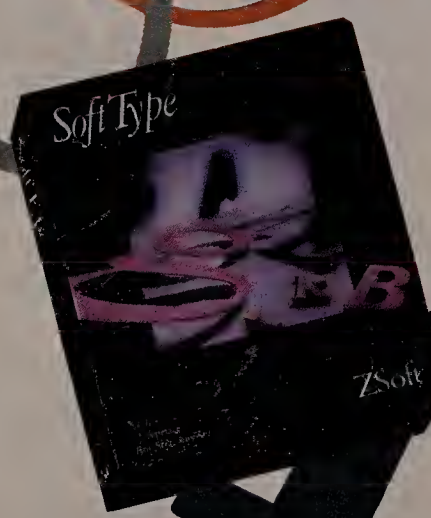


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using it as a file server, your choice of bus will have little impact on your system's performance. Even slower CPUs have plenty of muscle to handle all the I/O activity one user is likely to generate. If you do find yourself in the high I/O category, you can keep from hitting a bottleneck by choosing an EISA bus—assuming your peripheral controllers take advantage of it. But that's not a processor-related issue, since it's just as true at 25 MHz as it is at 50 MHz.

### You Want It, You Pay for It

Naturally, vendors have been quick to announce systems based on the new chip. And just as naturally, most of the new systems are expensive.

If you want a "basic" 50 (an ISA machine with 4MB of RAM, a 100MB to 200MB hard disk, and a color VGA monitor) you can get one for $3000 to $4400 from Atronics, Lightning, or CUI. (By comparison, a similarly configured 486/33 can be had from the same companies for as little as $2000.) As you move into higher-end, EISA-based 486/50s, prices run from $4300 (Lightning) to $15,000 (Wang). (EISA-based 486/33s in a similar configuration start at around $2700.) In tower configurations for network servers, a 486/50 can cost as much as $22,249.

If this seems like a lot to swallow, you may be able to do it in two bites—assuming your system allows you to upgrade the CPU. IBM, for example, does not yet offer a 50-MHz system, but if you've got $3695, it will sell you a 50-MHz upgrade board for 33-MHz PS/2 Models 90 and 95 XP. Many other vendors in this preview follow the same pattern, so if you were clever enough to buy one of their upgradable systems, you will probably be able to make a painless step up to the 50.

### Too Darn Hot?

Despite the price premium, plenty of takers were lining up for the new 50-MHz PCs when Intel abruptly suspended chip production and asked system vendors to halt their shipments. Intel blamed "high-temperature, high-frequency testing problems," which is to say that the chips overheated and became unstable. However, our interviews with vendors revealed only one instance of actual malfunction.

Shortly after the problem surfaced, Intel found a way to screen for it, but the yield of good chips was so low that resuming production would have been uneconomical. Instead, Intel elected to redesign the masks used in manufacturing despite the additional delay involved. By the time you read this, Intel is expected to have resumed production.

### Topping Off

Choosing a top-end CPU won't always be this easy. Early next year, Intel's user-installable, "double-speed" 486 CPUs should offer yet another high-performance option that may prove a lot cheaper. All you'll need to do is remove your present 486 chip and replace it with one of the new upgrade chips, which run twice as fast internally while using the same system clock and motherboard. (On 486SX systems, the chip fits into the coprocessor socket.) Initial reports suggest that performance improvements are impressive.

But for the moment, 50-MHz systems are the clear speed champions. And if the first round of announcements is any indication, speed addicts will certainly have no trouble choosing a real racer to meet their needs and pocketbooks.

*Michael Goodwin is an associate editor for* PC World.

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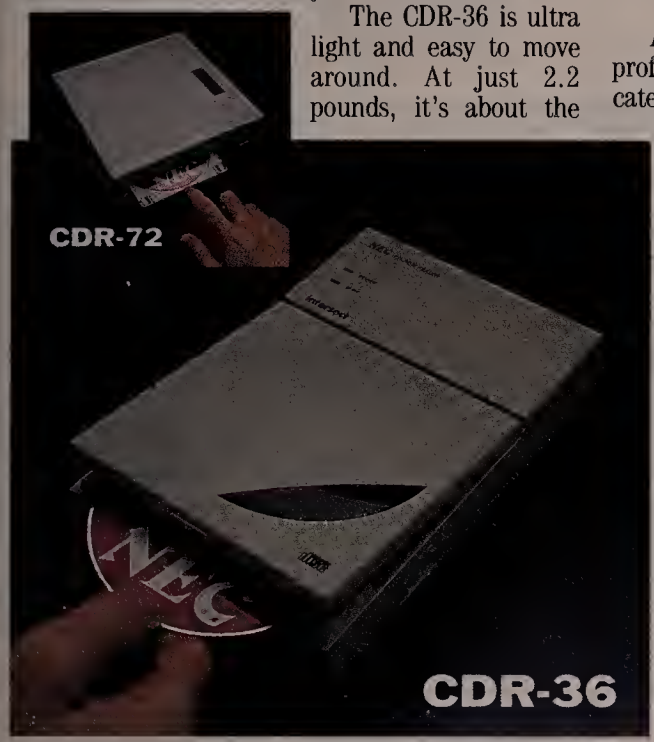


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# The Sharing Family With Peripheral Vision

Only Western Telematic's LASERNET sharing devices have true peripheral vision — the widest family of products to meet the needs of today's data sharing requirements. Whether it's a simple sharing set-up or a complex network — LASERNET has a device to fit your need and budget.

Western Telematic has peripheral vision in support software too! LASERNET provides easy-to-use device-select software operable with both Windows™ or MS-DOS® applications.

You won't need glasses to see that LASERNET offers the widest selection and best value for your money. Just take a close look at these LASERNET models and see which one fits your application:

## HIGH-LEVEL

### Multi-Link™

Serial/parallel device for twelve or more users. Expandable, through dedicated high-speed link, up to 384 any-to-any, user-selctable ports, over 4000 feet. Perform printer/plotter sharing, modem/FAX sharing, PC-to-PC file transfer and more.

- 12 concurrent high-speed ports — 8 serial, 4 parallel
- High-speed link — up to 32 Multi-Link devices — 384 total ports!
- Dynamically allocated, field-expandable SIMM memory — 256 KB to 4 MB
- RJ-11 serial ports for snap-in cabling
- Any-port-to-any-port connectivity
- Any-port designation for printer or plotter
- Each port individually programmable
- Windows or DOS pop-up menu software for instant device selection and status
- Uses standard parallel PC-to-printer cables

**12 any-to-any ports; buffered from 256 KB to 4 MB ..... start at $795**

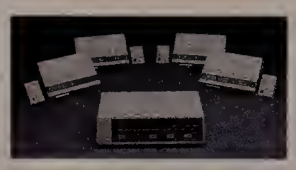
## GENERAL

### PSU-82C/SP

Programmable sharing units for both serial/parallel printers, plotters and PCs. Designed for CAD/CAE, high-level graphics, Desktop publishing or general applications.

- 4 concurrent serial and 4 parallel inputs (SP)
- 8 concurrent serial inputs (C)
- 1 serial and 1 parallel output
- Expandable buffer memory from 256 KB to 2 MB
- Separate baud rate, flow control, parity and messages for each port
- Pop-up menu software for easy printer/plotter selection
- Easy menu-driven configuration and set-up
- Prompt and response messages for plotter applications
- Support all laser printers including PostScript® printers and all types of plotters.

**8 inputs; 2 outputs; buffered from 256 KB to 2 MB ..... start at $595**

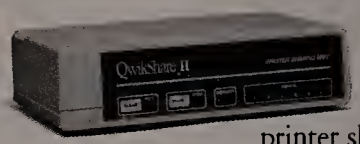


### QwikShare® III

Low-cost, expandable, all-parallel, high-speed printer sharing system. From one to 32 PCs independently share up to three remote and one local parallel laser/dot-matrix printer or plotter.

- Expandable to 32 PCs by adding Expansion Modules
- Memory expandable up to 4 MB
- Printer Select Switch — no software or TSR program required
- All parallel port connections — PCs, printers and plotters
- Maximum network distance — 4000 feet
- Quick and easy installation using snap-in, RJ-11 cable & standard parallel cables

**Printer Server; buffered from 256 KB to 4 MB ..... start at $295**
**Expansion Module with Printer Select Switch ..... $149 ea.**



### QwikShare® II

Low-cost, buffered printer sharing. Supplied with Windows and MS-DOS device-select software which provides pop-up menus for easy printer port selection.

- 6 RS-232 serial inputs - RJ-11 connectors
- 2 user-selectable laser/dot-matrix printer ports
- Expandable memory to 2MB using SIMMS
- Input speeds up to 115K baud

**6 inputs; 2 outputs; buffered from 256 KB to 2 MB ..... start at $295**

## BASIC

### QwikShare®

Complete, plug-n-go, "no-wait" sharing system. Up to six IBM PCs or compatibles can share a serial laser/dot-matrix printer or plotter. Each system contains: sharing unit; super-fast spooling software; three — 9- and 25-pin connectors; four —25 ft. PC cables; one —5 ft. printer cable & connector. Compatible with most popular graphics, word processing and spreadsheet software including Microsoft® Windows™.

**6 inputs; 1 output; ..... $195**

LASERNET products are **made in U.S.A.**, and backed by a **3-year** limited warranty with service and technical support. To get a closer look at LASERNET, just call on our technical sales representatives.

**To order* or for More Information, Call Toll-Free**
**1-800-854-7226**

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Circle 325 on reader service card

# Word for Windows 2.0: Getting Better All the Time

*Microsoft's Windows word processor gets a major upgrade, including exceptional graphics tools, easier-to-use features, and some innovations.*

**Word for Windows 2.0 has the features you need to create complex documents. Here, a chart from the charting module plus clip art included with the program helps punch up a newsletter.**

*George Campbell*

Microsoft's *Word for Windows*, already a good *Windows* word processor, is now more appealing than ever. In *Word for Windows 2.0*, Microsoft has simplified many of the features that you use on a daily basis, and its drawing and business graphics tools make this version stand up to graphical wizard *Ami Pro 2.0*. The new release also offers many tools not available in *WordPerfect for Windows*. Microsoft used new techniques in designing this version, with user testing going on simultaneously with program coding. The benefits are obvious in *WinWord 2.0*, especially in the way it makes common jobs less tedious.

### More of a Good Thing

*WinWord 2.0* is chock-full of improvements over earlier versions, starting with a new tool bar that holds icon buttons for your most commonly used functions. You can customize this bar by inserting icons or by attaching your own macros to a button. What's more, you can save different tool bars in template files, creating customized options for your different document types. Although the tool bar isn't movable, as are *Ami Pro 2.0*'s similar SmartIcons, it's always off the editing screen and out of the way. Add this feature to the convenient ruler and ribbon commands from version 1.1, and you'll rarely have to use the menus.

### Click-and-Drag Text

The most striking change in editing features is *WinWord 2.0*'s capability to move text with the mouse. To move a block of text, simply highlight it, then click and drag it to another location; this procedure avoids cut-and-paste commands. If you need to select a special character or bullet style, a dialog box lets you paste it in from a chart showing all the available characters. There's even a magnifying-glass feature. Just click on a character to see an enlarged view.

*WinWord 2.0* now has five editing views, rather than the previous version's four. To see the fine details in your document, use the new zoom-in layout mode to any magnification. As with the previous version, you can also choose from a draft mode for fast typing, a normal mode that lets you see fonts and graphics, a page layout mode with full editing and graphics controls, and a page preview mode that gives you an uneditable snapshot of your printed pages.

Also new are *WinWord*'s

## SNAPSHOT

**Microsoft Word for Windows 2.0**

WINDOWS A host of improvements and new features keep *Word for Windows* in the forefront.

**KEY FEATURES**

- **Frames for text and graphics**
- **Drag-and-drop text moving**
- **Object Linking and Embedding (OLE) support**
- **Drawing and charting modules**
- **Zoomable page layout mode**

**AVAILABILITY**

Fall 1991

**PRICING**

$495, upgrade from any *Word* version or competitor's product $129

**Microsoft Corp.**
One Microsoft Way
Redmond, WA 98052
800/426-9400,
206/882-8080

**Reader service no. 862**

preview boxes. As in *Ami Pro* and *WordPerfect for Windows*, you can see samples of fonts, borders, and most other features as you select options in dialog boxes. This eliminates much of the guesswork in setting up complex documents.

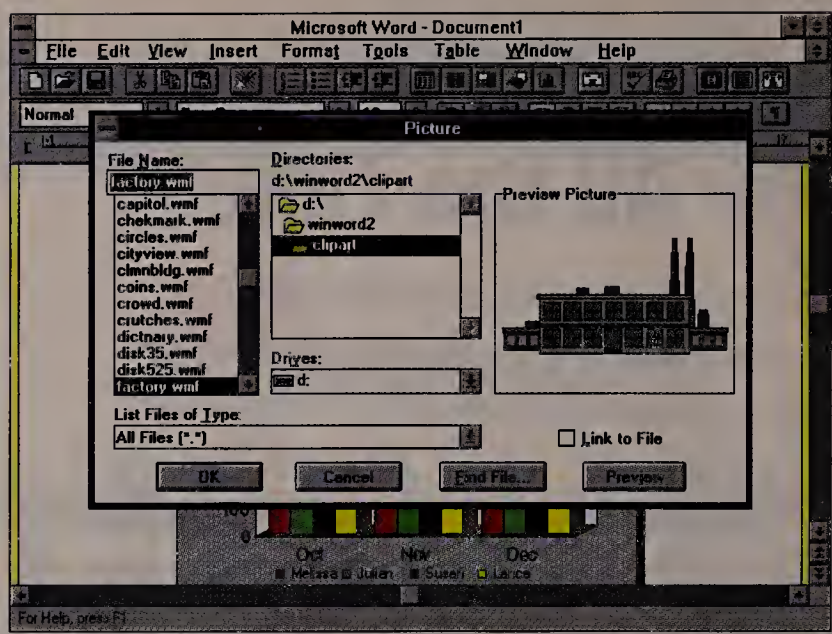
File handling also gets a major boost. *Word for Windows 2.0* automatically recognizes the format and loads the file without forcing you to confirm the file type in a dialog box. A fast search tool lets you find text anywhere on your system. And the file manager gives you a preview of document and graphics files before you import them.

### Power Plus Comfort

Microsoft didn't just improve *WinWord 1.1;* it threw in a slew of impressive new features. *WinWord 2.0*'s envelope creator, for example, lets you say good-bye to addressing envelopes by hand. Click on the envelope icon in the tool bar, and the program finds the address in your letter, then creates the proper envelope format. Place an envelope in the printer, and you're done.

Mail merges, usually a hair-pulling task, become simple. Version 2.0 can read *dBASE* and other data files directly. Choose a data file, then paste field names or merge commands into your letter from a dialog box. Once your document is written, *WinWord* lets you combine the spelling checker with the integrated grammar checker to spot goofs.

Microsoft also devised a secret weapon against its major competitor—a *WordPerfect* Help option that lets you use *WordPerfect 5.1* commands while receiving a demo of equivalent commands in *WinWord 2.0*. The commands work fine, and the option makes the transition from *WordPerfect* to *WinWord 2.0* relatively easy.




**Insert a picture into a document and you get a preview of the picture. WinWord 2.0 offers previews for most functions.**

### Getting the Picture

*WinWord 2.0* makes up for earlier gaps in its graphics capability—and surpasses *WordPerfect for Windows*—with a new set of powerful drawing and charting modules, along with frames for text and graphics. The frame tools let you position text or graphics anywhere in the document with a simple click-and-drag operation. You size a frame by dragging frame handles; image scaling and text wrapping are automatic. Frame options include several border types, shading, and automatic shadows, but *Ami Pro*'s rounded borders aren't available.

You can overlay graphics and text on any graphics file and import most graphic file formats into the drawing program. Using the module's set of basic drawing tools, you can then modify graphics with lines, curves, and more. A few dozen useful clip-art images come with the program.

The charting module provides several variations of two- and three-dimensional graph types. You can enter chart data in a spreadsheetlike data sheet, copy a table from your document, or import *1-2-3*, *Excel*, or comma-delimited data. Including the chart in your document is as simple as exiting the module. Once the chart is in the document, you can move it around or change its size with automatic scaling of the chart and its text.

### Linking Up

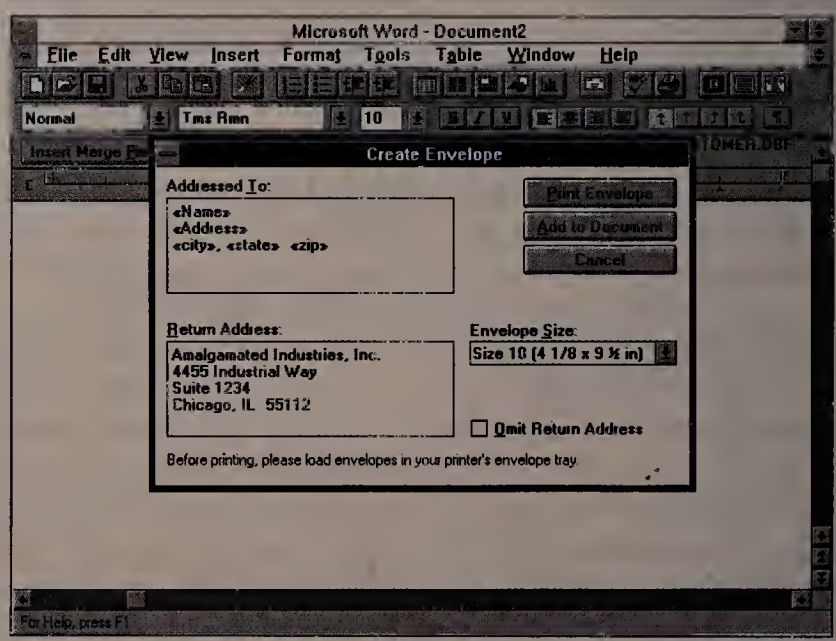
If you need to work with multiple documents and applications, you can take advantage of a new Object Linking and Embedding (OLE) feature, which Microsoft added to its Dynamic Data Exchange (DDE) feature. DDE links let you exchange data between other *Windows* programs, like *Excel.* Besides being easier to set up than DDE links, OLE links let you actually work with *Excel* tools from within *WinWord.* In *WinWord 2.0,* you form an OLE link to, say, an *Excel* worksheet simply by clicking on an entry in the Insert menu. When you want to make changes, you can simply double-click on the data, and then edit in the program that created the worksheet.

You can use both DDE and OLE links in *WinWord 2.0*'s Master Document feature. You can break down one very large document into manageable chunks that include links to other applications, and then use the Master Document feature to create a single master document that has both page numbers and indexes.

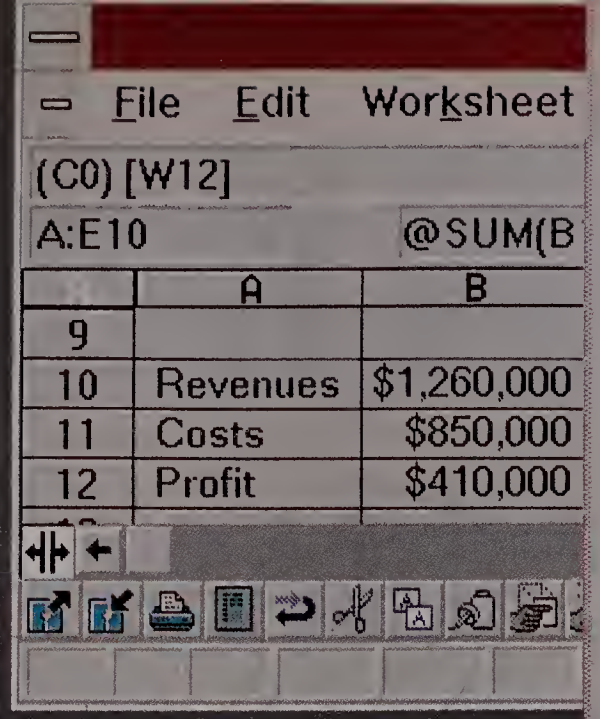
### An Outstanding Upgrade

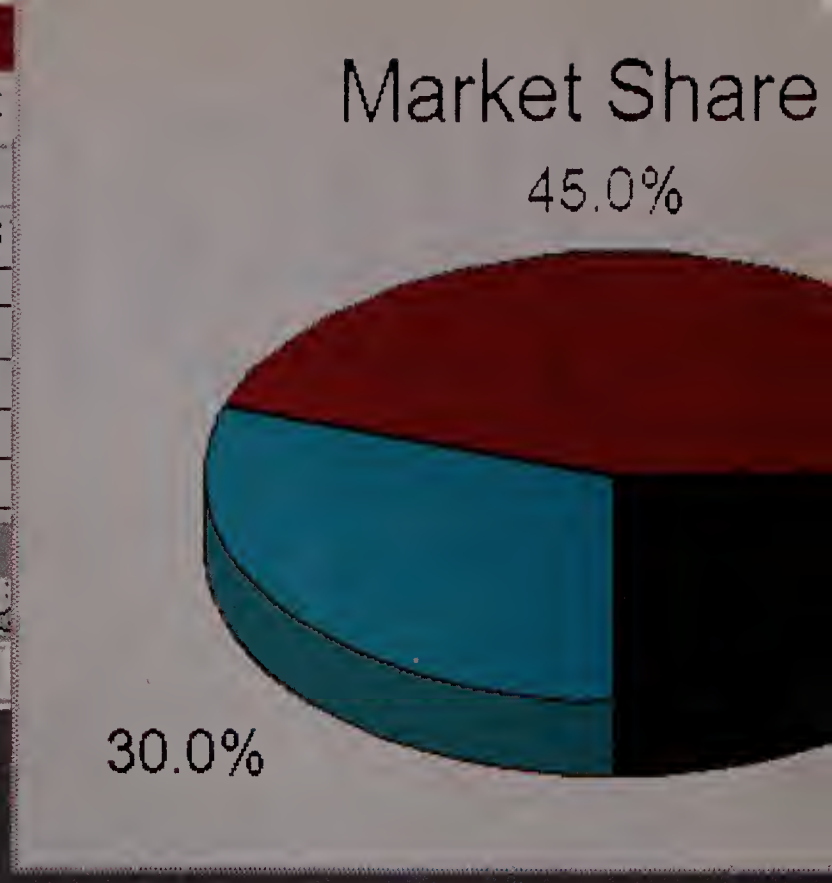
With all these features added to an already excellent program, *Word for Windows 2.0* gives *Windows* users just about everything they need in a graphical word processor, and more. *Word for Windows 2.0*'s friendly interface nearly rivals that of *WordPerfect for Windows*. And only *Ami Pro 2.0* offers an equally powerful set of options, plus superior handling of gray-scale files. All around, *WinWord 2.0* is a great upgrade and a good bet for new users.

*George Campbell is a contributing editor for* PC World.




**WinWord 2.0 lets you create and print envelopes with one simple command. You can even attach envelopes to mail merge documents for automatic printing.**




Ami Pro - [Untitled]

# Buy a ZEOS Get A Bundle!

Now, Lotus 1-2-3 for Windows and Ami Pro 2.0 are included with every ZEOS Windows system. Details inside!

1-2-3 for Windows

ZEOS®

# 1-2-3® for Windows

## Now included in every

*For a limited time only, ZEOS Windows systems buyers will also receive Lotus 1-2-3 for Windows plus Ami Pro 2.0, the Lotus Word Processing package for Windows. Complete and fully documented!*

*Your new ZEOS Windows system includes Microsoft Windows Version 3.0 plus a genuine Microsoft Mouse.*

*Unbelievable? Believe it!* Because now, when you buy any new ZEOS Windows® system, you will also receive Lotus *1-2-3 for Windows* plus Lotus' new word processor for *Windows, Ami Pro™ 2.0* at no additional charge!

It's the ultimate bundle! First, you're going to be receiving the incredible new ZEOS modular system complete with the upgradable CPU of your choice. These new ZEOS systems are the hottest computers money can buy. And that's just for starters.

Because you're also receiving the hottest software money can buy. Yet you don't have to buy it. Because we're including it at *no additional charge.* Go ahead and pinch yourself, it's really true!

And not only are you receiving the *amazing* new Lotus *1-2-3® for Windows* and *Ami Pro 2.0,* you're also getting Microsoft® *Windows* itself, plus a genuine Microsoft Mouse plus Microsoft *DOS 5.0.* All included at one low package price.

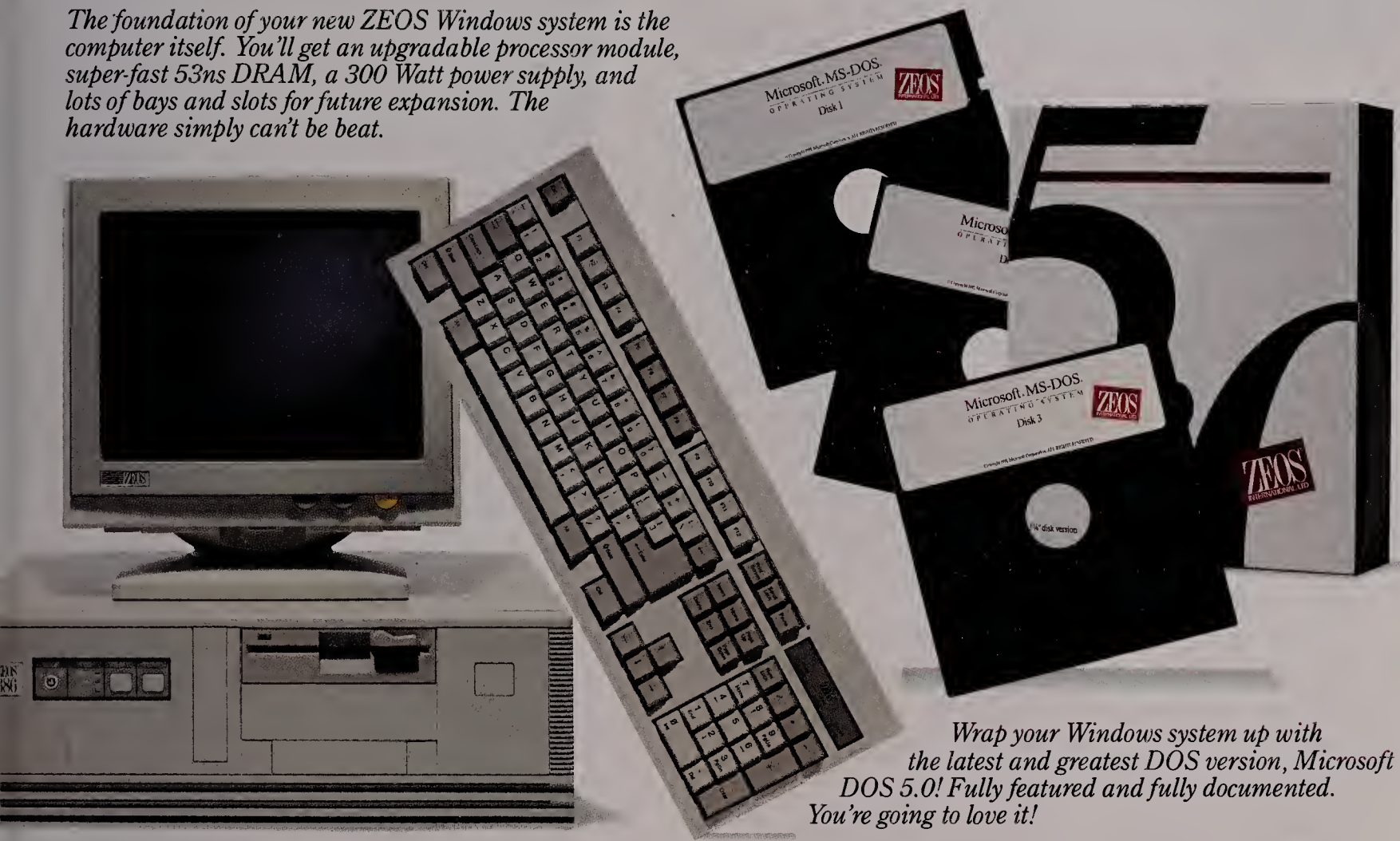
These are not some scaled down versions or trial disks either. They are the *complete* and *fully documented* editions of Lotus *1-2-3 for Windows* and Lotus *Ami Pro 2.0* for *Windows* provided to you by special arrangement between ZEOS and Lotus. This is one incredible value that no one else can offer. You're going to love it, too.

Because nothing else brings out the power of the most powerful software like your blazing new ZEOS system. And when you strap your-

# plus Ami Pro® 2.0!

# EOS Windows System.

*The foundation of your new ZEOS Windows system is the computer itself. You'll get an upgradable processor module, super-fast 53ns DRAM, a 300 Watt power supply, and lots of bays and slots for future expansion. The hardware simply can't be beat.*




*Wrap your Windows system up with the latest and greatest DOS version, Microsoft DOS 5.0! Fully featured and fully documented. You're going to love it!*

self in and fire up *Windows* with Lotus *1-2-3* and *Ami Pro,* you're in for the ride of your life!

After all, nobody knows spreadsheets better than Lotus. And when they sat down to write *1-2-3 for Windows* they created a masterpiece. It starts out as a full-fledged *Windows* application. Offering that perfect balance of power and simplicity, it remains fully compatible with all the earlier versions of *1-2-3*. And it's absolutely loaded with new features.

Power, Simplicity, complete Compatibility *plus* loads of new features. It's Lotus *1-2-3 for Windows* and it comes with every ZEOS Windows system. And so does *Ami Pro 2.0!*

After all, *Ami Pro 2.0* is the Lotus word processing program that was designed for Windows from the ground up. Linking with a full suite of Windows applications *including* your new Lotus *1-2-3 for Windows, Ami Pro 2.0* is perhaps the finest word processor on the market today.

Buying your new ZEOS Windows system is possibly the best purchase decision you'll ever make. Then add to it Lotus *1-2-3 for Windows, Ami Pro 2.0* plus *Windows 3.0, DOS 5.0* and a genuine Microsoft mouse. It's an offer that can't be beat and one we simply can't offer for long. So pick your new ZEOS Windows package now and we'll include a bundle! *Call now 800-423-5891!*

Upgradable. High Performance. Low Cost. And every ZEOS Windows system comes with Lotus *1-2-3 for Windows* and *Ami Pro 2.0* at no additional charge. Absolutely incredible!

With ZEOS 386-25s starting at only $1395 right thru '486-33MHz systems starting at $1795, computing will never be the same again! And it's not just the prices that make these new systems hot. It's Performance and Upgradability as well.

## UPGRADABLE CPU

When we first sat down to design these new systems, we wanted computers that would *blow the doors off* anything else out there. Plus, we wanted you to be able to upgrade from one CPU to another as your computing requirements changed, *without having to buy an entirely new system.* The results?

Incredibly low cost, high performance systems so very advanced you can move freely from the '386 family of processors to the latest '486s all without a moment's hesitation.

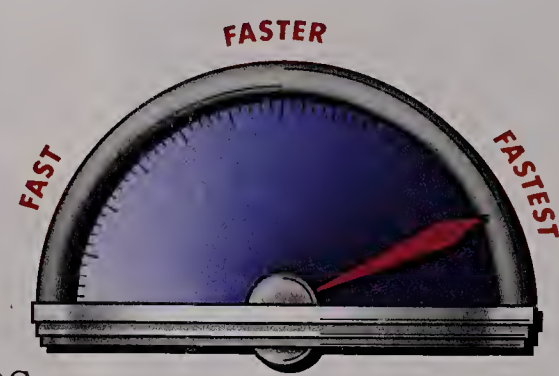
Now, you can pick your power! Today *and* tomorrow. Choose from high speed '386-25 and 33MHz systems, either cached or non-cached, plus the '486SX and '486-33MHz with or without a secondary cache. Whichever you decide upon you know that as your computing requirements change, your processing power can change as

# Upgradable.

## Hot New ZEOS '386

well. But are the prices really that good?

Yes. *Absolutely Yes!* The prices really *are* that good, and the quality too. Because when you buy from ZEOS you're buying directly from the manufacturer. Starting with the main system board, your new computer is designed and built by us right here in Minnesota. That saves money for you. And your ZEOS factory direct advantages are evident not only in the price, but in the performance and quality of your system too.



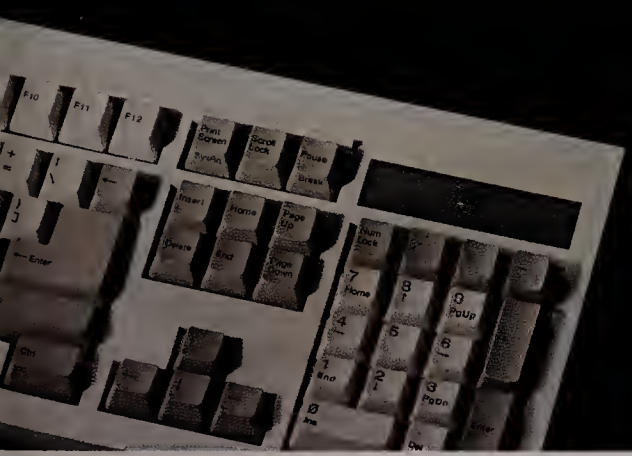

**Z•SPEED METER**

*To help you select the processor option that's right for you, we have developed the* Z-Meter. *The* Z-Meter *shows you the relative performance gains achieved by moving from one processor module to another—fast, faster, fastest! No matter which system you select you can be sure of one thing*—these babies are Hot!

Not only that, but your new ZEOS system is supported around the clock by our 24 Hour a Day Toll Free technical support hotline. Should you have any questions, we're here to help, 24 hours a day, 365 days a year!

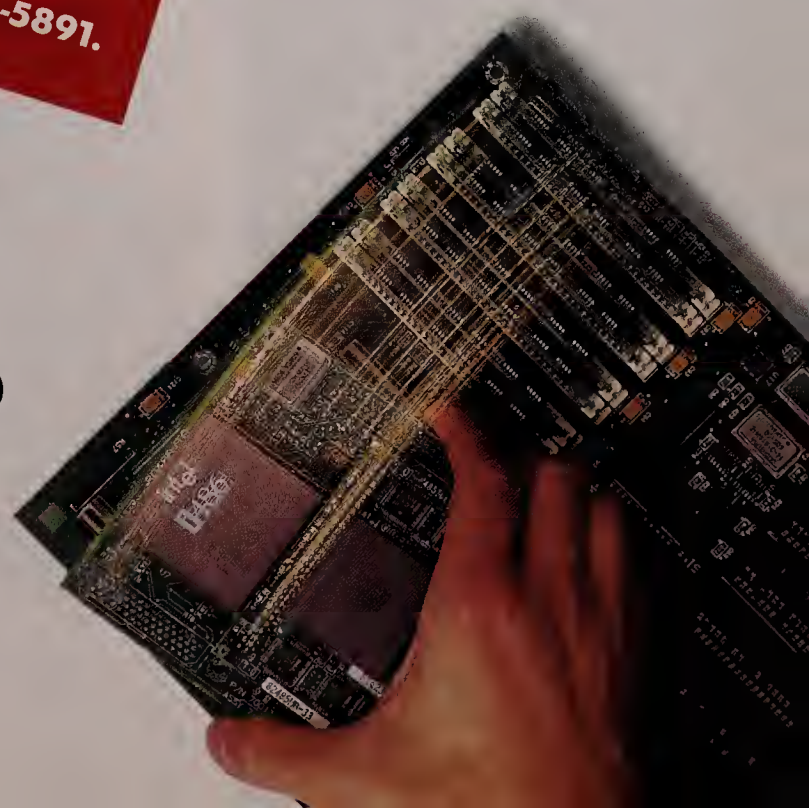
So if you're looking for a high speed, upgradable, rock solid system supported like none other *and* you want incredibly low prices, you've found your company. And your computer. Read on!

**This ZEOS ad reviews each of four money saving upgradable system packages based on processor type. For a limited time only, every ZEOS Windows system includes Lotus 1-2-3 for Windows and Ami Pro 2.0 at no additional charge! Call 800-423-5891.**



# Low Cost.

## nd '486 systems!



# ZEOS. Your

*For Vertical Systems add only $150.*

Harnessing the ZEOS power and value you want is easy. Pick your processor then your package. Package #1 gets you up and running for a very reasonable price. To add even more options *and* savings select from Packages 2, 3 or 4.

Because when you select from Packages 2, 3 or 4 you receive VGA, additional memory, larger drives and more. You also receive *Windows 3.0* plus Lotus *1-2-3 for Windows* plus Lotus' great new *Windows* word processor *Ami Pro 2.0,* plus Microsoft *DOS 5.0* plus a genuine Microsoft Mouse. Nobody gives you this combination of hardware *and* software power. And it's yours, all for one low package price!

And that's just for starters. Because *inside* your new ZEOS system rests the very latest advancements in surface mount, high integration technology. As an example, we have freed two normally occupied expansion slots by placing our high speed IDE hard drive and floppy drive interfaces right on the main board. Then, we put the high speed serial, parallel and game ports on the motherboard too. The result?

Eight expansion slots, *seven* of which are available for your future use! After all, expansion and non-obsolescence are what these great new ZEOS systems are all about. We've built in some other very important expansion features for you as well.

Like our *300 watt* power supply. Providing you with all the pure clean power you'll need right now, your ZEOS 300 watt supply also provides you with plenty of power for the future as well. Plenty of slots, plenty of power. How about space? This is where ZEOS has performed something akin to magic.

It's your new ZEOS SpaceSaver case! Complete with *seven drive bays,* this incredible case is actually *smaller* than many cases offering only five bays. We've also added *a second whisper quiet cooling fan.* Why? Because whether you expand your system or not, the cooler it

## ZEOS COMPLETE SYSTEM PACKAGE #1

- The Processor and Speed of your choice plus future upgradability!
- 1MB of High Speed 53ns DRAM, expandable to a system total of 32MB right on the motherboard.
- 42MB High Speed IDE hard drive with its own cache.
- 1.2MB or 1.44MB Teac® floppy drive.
- ZEOS 14" flat screen Hi-Res amber monitor with Tilt/Swivel base.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two Serial, one Parallel & one Game Port built right onto the motherboard.
- 7-16, 1-8 bit expansion slots. 80387 math co-processor support for '386 systems.
- Rugged ZEOS SpaceSaver case with twin cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

| PACKAGE #1 | |
|---|---|
| 486-33 | $1795 |
| 486SX-20 | $1595 |
| 386-33 | $1495 |
| 386-25 | $1395 |

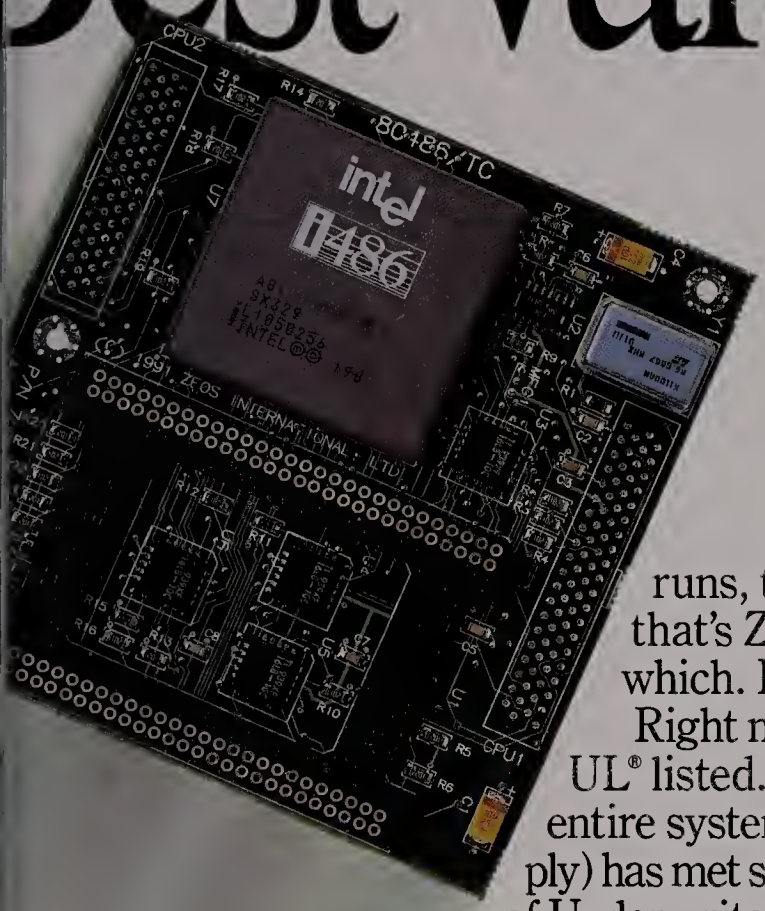
## INCREDIBLE ZEOS PACKAGE #2

We take Package #1 and upgrade your ZEOS Modular System to include:

- 2 full Megabytes of Rip-roaring 53ns DRAM.
- Our incredible 85MB IDE hard drive with its own built in cache.
- Both the Teac® 1.2MB *and* 1.44MB floppy drives.
- The awesome Diamond SpeedStar Plus VGA graphics card Complete with 1MB DRAM.
- ZEOS 14" High Res VGA Mono Monitor with Tilt & Swivel base.
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!

| PACKAGE #2 | |
|---|---|
| 486-33 | $2395 |
| 486SX-20 | $2195 |
| 386-33 | $2095 |
| 386-25 | $1995 |

# Best Value!




| |
|---|
| 486-33 $2895 |
| 486SX-20 $2695 |
| 386-33 $2595 |
| 386-25 $2495 |

runs, the longer it will last. Now that's ZEOS *value*. Speaking of which. How about UL® listings?

Right now every ZEOS system is UL® listed. This listing means your entire system (not just the power supply) has met stringent safety requirements of Underwriters Laboratories. We believe UL® listings also say a lot about quality. And UL® safety listings are something many of our competitors simply don't (or can't) provide. At ZEOS quality and safety are important to us. *You* are important to us.

Price. Performance. Quality and Support. There are *many* reasons to buy your new ZEOS upgradable system. Plus, your ZEOS advantages include *24 Hour a Day Toll Free* Support and our 30 Day Money Back Guarantee and ironclad warranty (for more ZEOS advantages see the section entitled *"Why ZEOS is Your #1 Choice")*.

| |
|---|
| 486-33 $3395 |
| 486SX-20 $3195 |
| 386-33 $3095 |
| 386-25 $2995 |

Selecting your new ZEOS system is easy. Choose from any of the money saving packages shown here. Or let your friendly and knowledgeable ZEOS Systems Consultant help you configure exactly what you want from our huge selection of upgrades and options. Whatever you select, one thing is for certain.

Buying your new ZEOS system is perhaps the best purchase decision you'll ever make! Simply pick up the phone and give us a call now. Incredible ZEOS power awaits you! *Call now Toll Free, 800-423-5891.*

*For Complete Processor and Package Pricing, simply turn the page!*

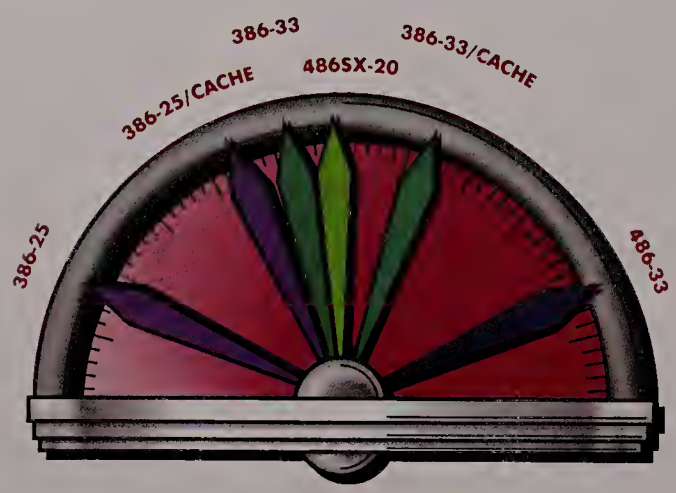
# Pick You
# Package

## Or Let Us Custom Build to

Now, ZEOS lets you pick the power you want for the price you want to pay! Not only that, every ZEOS Windows System (Packages 2, 3 and 4) includes not only Microsoft *Windows, DOS* and a mouse—we're also including Lotus *1-2-3 for Windows plus* Lotus' new Windows word processor *Ami Pro 2.0!*

And with your new ZEOS modular system, the computer that's right for you today is also the computer that's right for you tomorrow. In the future, you can upgrade to even more performance with a new '386 or '486 processor module.

And that's only the start of your many ZEOS system advantages. But what more could there be than dazzling performance, incredible prices and upgradability? From ZEOS there's lots more.

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- Our fast 130MB IDE hard drive with built in cache.
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- Your Diamond VGA Plus card with 1MB DRAM.
- ZEOS 14" 1024x768 VGA Color Monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0, Microsoft Windows, DOS 5.0 *plus* a Microsoft mouse!

**PACKAGE #3**

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- Both Teac® floppies, the 1.2MB *and* 1.44!
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# Why ZEOS is

CHECK YOUR EXCLUSIV

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- Now, your ZEOS modular system allows you to upgrade from one CPU to another as your computing requirements change. Obsolescence is virtually obsolete!
- You may choose between a variety of '386 and '486 processor options, both cached and non-cached.
- Made in USA! Your new ZEOS system boards are designed and manufactured by ZEOS, right here in the USA.
- ZEOS has utilized the very latest in highly integrated surface mount technology. Faster, cooler, more reliable systems for you!
- Every ZEOS modular system comes standard with incredibly fast *53 nanosecond DRAM.*
- Plus, you may expand your system with up to 32 megabytes of memory right on the motherboard.
- Your new system features the *exclusive* ZEOS seven bay desktop case, smaller than most five bay cases yet plenty of room for future expansion.
- Two whisper quiet cooling fans move more cool air thru your system increasing reliability and component life.
- Your *entire* system is UL® listed (not just the power supply). Few others offer this security; we wonder why.
- Eight slots, one for the video, seven more open providing plenty of room as your system requirements grow.
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- Our top quality 300 watt power supply provides you with plenty of power for your present *and* future needs.
- ZEOS uses *only* genuine Teac® floppy drives. Accept nothing less.
- Monochrome TTL systems feature Genuine Hercules® brand graphics controllers. Only the best for you.

# Your #1 Choice!

**ZEOS ADVANTAGES:**

**while others are subtle yet critical to your ultimate satisfaction. We'll go over them here with you one by one.**

**Please feel free to use these as a basis for comparison with other system vendors. We believe you will come away with the conclusion that *ZEOS is indeed Your #1 Choice.***

✔ VGA color systems feature the high-res ZEOS 1024x768 monitor with the incomparable SpeedStar Plus card complete with One Full Megabyte of memory!

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✔ For a limited time every ZEOS Windows system also comes with Lotus *1-2-3 for Windows* plus Lotus' incredible new Windows word processor *Ami Pro 2.0!*

✔ *PC Magazine* said ZEOS offers "more options than even the most configuration hungry hound could possibly need." Let us build whatever you require.

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✔ Friendly, knowledgeable ZEOS Systems Consultants are available 24 Hours a Day by calling 800-423-5891. You can call any time.

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A married person may apply for individual credit. I am applying for (please check appropriate box):

☐ **JOINT CREDIT** with another person. Complete entire application.

☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.

☐ **INDIVIDUAL CREDIT.** Do not complete Section C.**

**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

**NOTICE TO WISCONSIN APPLICANTS:** YOU MUST DISCLOSE YOUR MARITAL STATUS:

☐ married ☐ unmarried ☐ legally separated

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Name _____

Home Phone (_____) _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____

Previous Address _____

City _____ State _____ Zip _____

Employer _____ Since? (Mo./Yr.) _____

Monthly Gross Salary $ _____ Daytime Bus. Phone (_____) _____

Previous Employer _____ _____ From - To

Occupation _____

**Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.**

Additional Monthly Income $ _____ Source: _____

Name & Address of Nearest Relative Not Living With You _____

_____ Relationship _____

## B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE: Checking Account ☐ Yes ☐ No
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| | Y/N | How Many? | | Y/N | How Many? |
|---|---|---|---|---|---|
| Bank Loan | ___ | _____ | Dept. Store Charge Card | ___ | _____ |
| VISA | ___ | _____ | Credit Union Account | ___ | _____ |
| MasterCard | ___ | _____ | Other Major Charge Cards | ___ | _____ |
| Finance Company Loan | ___ | _____ | | | |

## C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Home Phone (_____) _____ Date of Residence _____ (Mo./Yr.)

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Bus. Phone (_____) _____ Monthly Gross Salary $ _____

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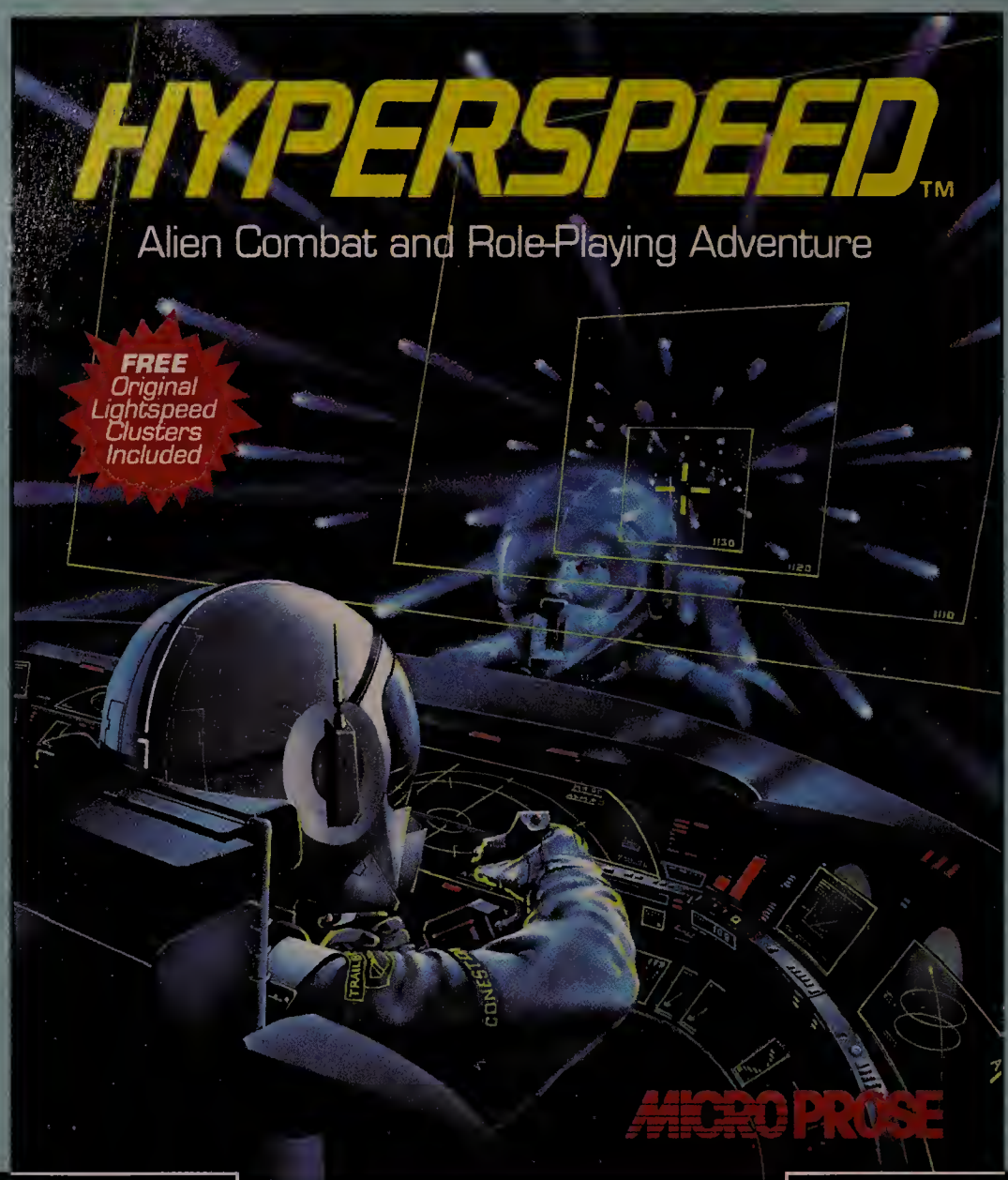
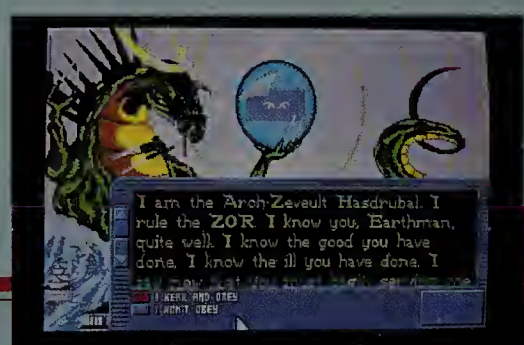
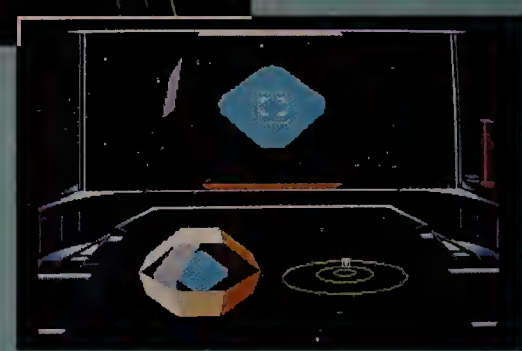



Look for an F-117A Stealth Fighter Demo in specially marked packages of TDK Micro Floppy Disks.
TDK.

IBM-PC screens shown.



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# Harvard Does Windows

*Harvard Graphics joins the Windows generation—blending presentation power with simplicity.*

**Harvard Graphics for Windows lets you open and edit multiple presentations in different views—including an outliner and slide editor—or shuffle slides using a graphical slide sorter.**

*Richard Jantz*

One by one the leading presentation packages have taken to *Windows* like dogs to a bone. Now *Harvard Graphics,* top dog in DOS presentation software, has joined the *Windows* pack and the result is a howling success.

*Harvard Windows* makes it easier than ever for you to produce 35mm slides, transparencies, printouts, and screen shows. Its global presentation controls should make *Windows* believers out of its DOS devotees, and should give Microsoft's *PowerPoint,* Aldus's *Persuasion,* IBM's *Hollywood,* and Lotus's *Freelance for Windows* a run for your money. (See "One-Touch Presentation Software," November 1991.)

### Easy and Obedient

With *Harvard* you can edit multiple presentations in separate windows and swap slides between them. You can apply predesigned templates and color schemes with a few clicks of the mouse. And you can shuffle slides using a graphical slide sorter, edit your presentation via an integrated outliner, or zoom in for detail work on individual slides.

Like *PowerPoint, Harvard* is well designed and highly intuitive—it even includes design tips as part of its context-sensitive help system. A generous selection of templates and 15 scalable Bitstream fonts make it easy to create professional-looking text charts, tables, and graphs. Longtime *Harvard* users can rest easy: You can import presentations made with the DOS version, but you'll have to do it one slide at a time.

*Harvard* gives you easy access to the latest data. You can hotlink chart and spreadsheet files using *Windows'* Dynamic Data Exchange (DDE), which updates charts whenever the source data changes. You can also launch another application during a screen show—so you can, say, jump right into an *Excel* worksheet for on-the-spot data analysis.

However, gaining simplicity means sacrificing some features. *Harvard's* outliner and master templates aren't as sophisticated as *Persuasion's,* and its drawing and enhancement tools can't match those in *Hollywood* or even the DOS-based *Harvard 3.0.* You can't, for example, align text on a curve or create simple animation effects. *Harvard* also lacks such niceties as *Hollywood's* automatic speaker notes and run-time (self-running) screen show capability.

Still, *Harvard Windows* strikes a careful balance between *PowerPoint's* ease of use and the advanced features of *Hollywood* and *Persuasion.* Easier to master than its DOS predecessor, *Harvard* will appeal to users looking to unleash the power of *Windows* in their presentations.

*Richard Jantz is a contributing editor for* PC World *and author of the forthcoming* Ventura Publisher 4.0 for Windows *(John Wiley & Sons, New York, 1991).*

## SNAPSHOT

### Harvard Graphics for Windows

WINDOWS With its global cantrals and predesigned templates, *Harvard Windaws* promises to be a surefire hit with presentatian navices and veterans alike.

**KEY FEATURES**

- **Integrated outliner, slide sorter**
- **Library of 55 professionally designed presentation template styles**
- **Built-in spelling checker**
- **Capability to launch other applications during screen show**

**AVAILABILITY**

February 1992

**PRICING**

$595; upgrade fram Harvard Graphics 3.0 $50, fram 2.x $125

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Santa Clara, CA 95051
408/986-8000

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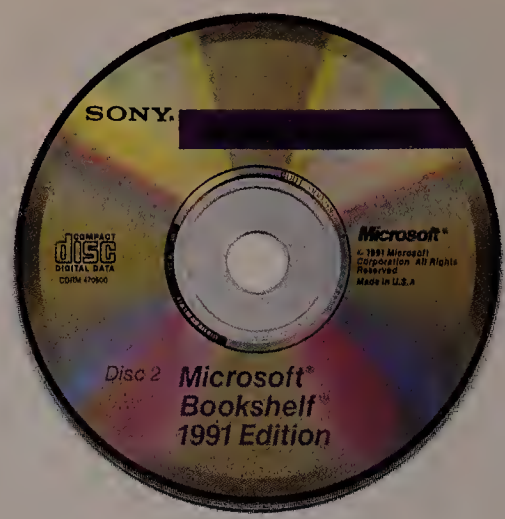

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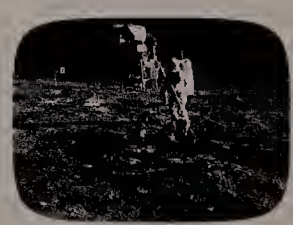

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October 29, 1991
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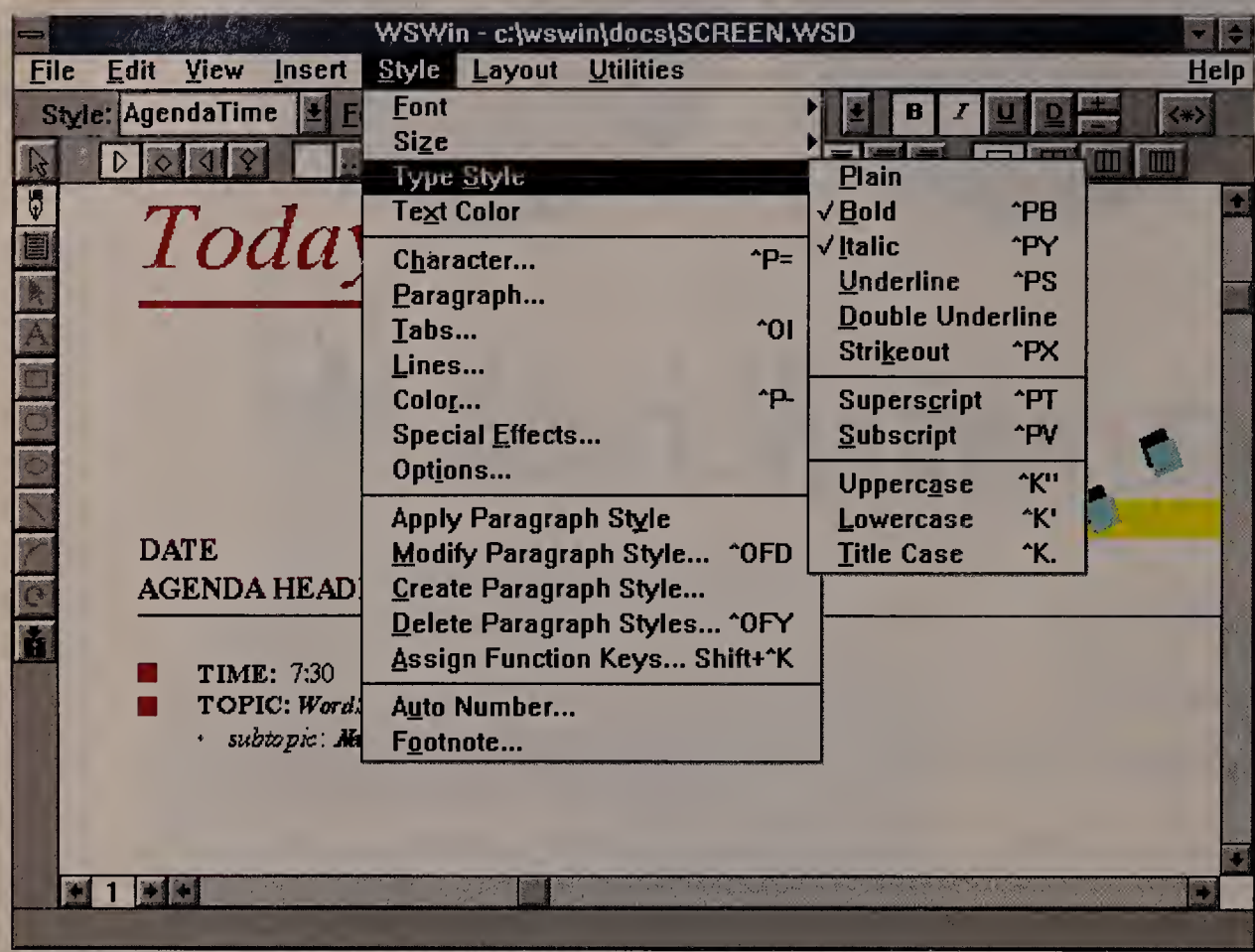
# WordStar Soars Into Windows

*Does WordStar for Windows have the right stuff to launch WordStar fans into the graphical word processing world?*




**WordStar for Windows lets you access functions using familiar WordStar keyboard commands.**

*Rex Farrance*

I confess—I'm a *WordStar* user. And I'm proud of it, despite all the heckling I take from my co-workers. The composition tools are quick and capable, and there's nothing like that <Ctrl>-*key* cursor diamond for fast editing.

Still, I've lusted in my heart as I watched colleagues make words jump through hoops in *Ami Pro* and *Word for Windows*. When would *WordStar* come out with a *Windows* version for me? Well, *WordStar for Windows 1.0* is here at last. And WordStar is smoothing the transition by letting DOS veterans hang onto many—though not all—of the classic *WordStar* commands. The program has particular appeal to those of us who perform light desktop publishing.

### Entering the Windows World

WordStar has squeezed a wealth of tools onto the default page-editing screen: The Menu bar, Style bar, and Tab/Align bar cross the top; publishing tools line the left side; and the Status bar crosses the bottom. Zoom in to magnify or shrink your page, and you can edit in zoom views.

It's a snap to style text. You have quick access to Bitstream *FaceLift* scalable fonts and to color choices. The program's 40 modifiable templates let you set up paragraph styles with 60 attributes.

But far beyond that, the program gives you plenty of desktop publishing moxie. You get an impressive array of layout and typographical tools. You can place graphical or text elements in fixed or floating frames that can be positioned, sized, stretched, cropped, or rotated in 1-degree increments. Typographical controls include precision kerning, tracking, leading, and widow control. The program imports nine graphics formats and includes 75 clip-art files. The *Micrografx Designer*–based drawing tools are first-rate.

So are the on-line help and tutorial, and the package integrates *Correct Grammar* plus a powerful spelling checker and a thesaurus. It also automatically recognizes and imports files from almost all major word processors.

### Still Wishing on a WordStar

But *WordStar for Windows 1.0*'s ease of use doesn't quite keep pace with that of *Ami Pro*, *Word for Windows*, or *WordPerfect for Windows*. You have to muddle around with dialog boxes to complete a few common tasks such as setting margins. And you can open only one document at a time. The program lacks a macro language, outliner, group editing tools, math functions, automated templates (prompted fill-in forms), and a charting module. It supports DDE but omits application-invoking OLE links.

This new variation on an old favorite may not rocket past the *Windows* competition. But if you need capable desktop publishing tools and don't want to retrain your fingers, it may be just what you're looking for.

*Rex Farrance is a* PC World *assistant editor.*

**SNAPSHOT**

**WordStar for Windows 1.0**

WINDOWS This graphical word processor delivers desktop publishing power without abandoning its fast editing skills.

**KEY FEATURES**

- **Choice of keyboard configurations**
- **Frame-based layout system**
- **Precision typographical controls**
- **On-the-fly file conversion**
- **Bundled Correct Grammar and FaceLift**

**AVAILABILITY**

Immediate

**PRICING**

$495, upgrade from DOS WordStar or most other word processors $129, upgrade from WordStar Legacy $49.95

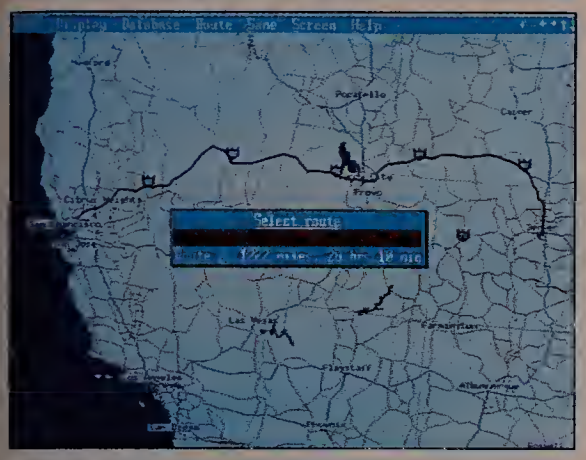
**WordStar Int'l**
201 Alameda del Prado
Novato, CA 94949
800/227-5609,
415/883-1629 (fax)

**Reader service no. 848**

# The Intelligent Road Atlas For Your PC!

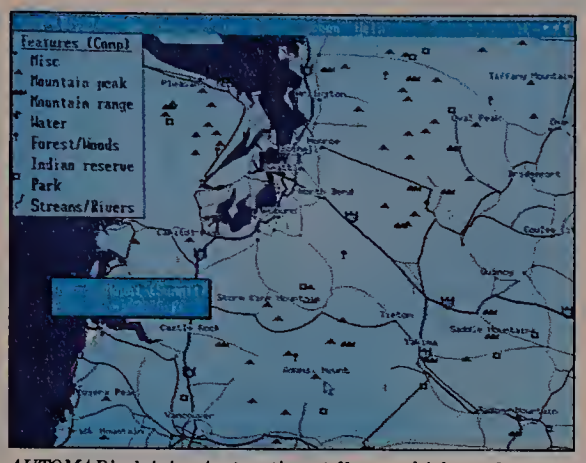
Planning a vacation? Heading out on the road on business? Now there's a system that helps you plan any road trip for fastest, prettiest or most convenient route — with hundreds of up-to-date, color maps right on your computer screen.

Clear, detailed maps that can get you anywhere in the United States that you want to go. Just tell AUTOMAP where you're going, when and where you'll be starting from, what areas you'd like to avoid, what areas you'd like to visit on the way and how you like to drive. It's fast, fun and informative.




*Select your starting point, end destination, and areas to visit and let AUTOMAP create a detailed map of your next trip!*

AUTOMAP's powerful intelligence takes over from there. Instantly, it searches its massive database of over 300,000 miles of roads and highways for the best route to meet your requirements. It even gives you a list of alternative routes if you decide you'd like to wander a bit. AUTOMAP also gives you a list of "places" from over 50,000 in its database. It's like having a travel guide pointing out the very best there is to see and do. Business travellers won't have to worry about being unfamiliar with new territories — just a quick session with AUTOMAP and you'll know exactly where you're going.

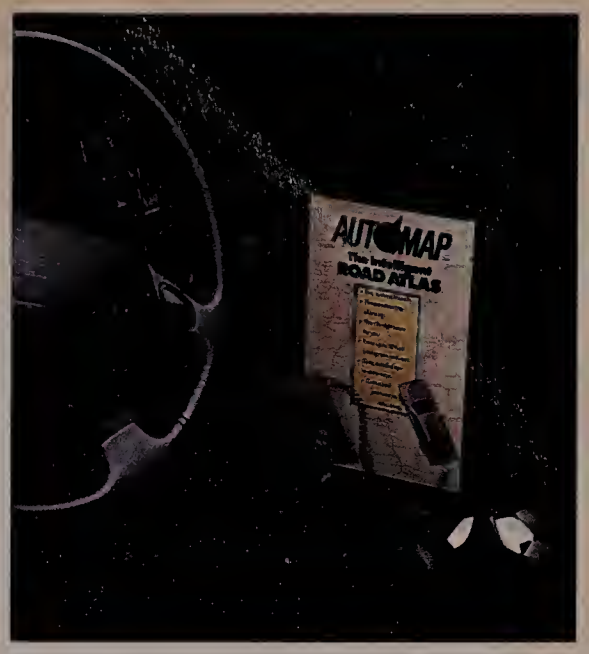



*AUTOMAP's driving instructions tell you which roads to travel, how far to go, and approximate traveling time.*

AUTOMAP allows you to view your entire journey as a full color map and gives you all the details on mileage. Zoom out to see the entire region, or zoom in to see every detail. AUTOMAP's driving instructions list all the roads you'll be traveling, exactly how far to go, exactly where to turn and even the signs to look for! These maps and directions can be viewed on your screen and printed out to refer to as you need them.

### Government Highway Data.

AUTOMAP uses data with the renowned accuracy of government sources. It has been designed to remain accurate with constant updates of new maps and details as they become available. AUTOMAP has




proven itself with the most demanding businesspeople and vacationers. It's helpful and convenient, but more importantly, AUTOMAP will save time, money and frustration. In fact, surveys show that AUTOMAP can easily save up to 20% in driving time and related costs. There's even a built-in quiz to test your knowledge of geography.

AUTOMAP™ INCORPORATED

**AUTOMAP**

BL4098-5 **AUTOMAP** 5½″ ..... **$79.95**
BL4098-3 **AUTOMAP** 3½″ ..... **$79.95**
*Hercules, CGA, EGA, VGA, 512K RAM, hard disk, mouse recommended.*

# JUST RELEASED — AMI PRO 2.0!

**The Number-One Rated Windows Word Processor. Easier, Faster, More Creative.**

Ami Pro has created a world of possibilities for the printed page. It is a pure Windows product, not a "ported" DOS counterpart. It features the visual power and easy-to-use nature of Windows 3.0 to produce top-notch results. Indeed, it established a new standard in word processing for the graphical user interface. Now, version 2.0 breaks new ground with a rich visual environment along with an amazing array of easy-to-use tools at your fingertips. You'll write and format sophisticated documents you may have never attempted before because Ami Pro 2.0 is designed to work like you do, associating pictures and symbols—with concepts. Your ideas take shape faster and expressing them becomes easier. That's the key: Ami Pro 2.0 is extremely easy to use. So easy to use in fact, that you can create crisp, professional-looking letters, reports, proposals and presentations the very first time you use it—even if you've never used a word processor before!

### An Ideal Writing Environment. Fast, Smart — and Visual.

Ami Pro 2.0 features fast outlining, easy revision marking, mathematical equations and even freehand drawing. You'll put together charts and tables with simple point-and-shoot action. You'll see your work with true WYSIWYG display. You'll enjoy the built-in portfolio of style sheets and graphics-manipulation tools. Simply choose from pull-down menus to generate a table of contents, flow text around graphics, change fonts, colors and more. You'll select typefaces and move elements on the page easier than you ever thought possible. Ami Pro 2.0 gives you the best spell checker in the business, a thesaurus with 1.4 million selections, a full macro language, an interactive ruler, status bar, color palette and much more. More than Word For Windows. More than WordPerfect.

### Power Under the Hood!

Although Ami Pro 2.0 is a breeze to use (and use to its fullest), it posesses enormous power under its sleek interface. You'll seamlessly import and export files from WordPerfect, Microsoft Word, MultiMate, DCA, DisplayWrite, WordStar and others. Ami Pro 2.0 contains over 120 one-click SmartIcons (which match those found in Lotus 1-2-3 for Windows) that make moving through Ami Pro 2.0 fun, and you can customize and arrange them any way you like.

Open and edit multiple documents at one time, see them in four editable view levels — all WYSIWYG and instantly "hot-link" to other Windows applications, including Lotus 1-2-3, with 2-way Dynamic Data Exchange (DDE).

### Power Fields.

You can actually create documents automatically using this innovative technological feat. Power Fields are embedded commands that, typed directly into a document, enable it to perform a task automatically. For example, a business letter can request the input of a name, look up the address from another file, automatically place the name and address on the page in a pre-defined format and include various paragraphs or passages depending on the data provided. A power field could also be used to check the state or zip code in the address and determine whether a local or toll-free phone number should be included in the body of the letter.

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Lotus®

**Ami Pro**

BL5090 **Ami Pro** *Competitive Upgrade* 5¼″ & 3½″. **$109.95**
BL5095 **Tiger Pack:** Ami Pro *Competitive Upgrade*, Logitech Mouse and Microsoft Windows 3.0; 5¼″ & 3½″ .... **$169.95**
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# NEW! The Daily Number Buster Version 2.0!

**The Most Advanced Daily 3-And-4-Number Software Available!**

From the makers of the smash hit The Complete Lottery Tracker and Wheeler comes the winningest DAILY number program available today. The Daily Number Buster will increase your chances of winning 3 and 4 digit daily number games and all daily deal games (California's "Decco" and Ohio's "Cards"). It's fast, fun and completely menu driven, so it's ready to go right out of the box.

This new version has been completely redesigned, with dozens of new screens and features to help you play these games with the odds on your side! You can store hundreds of 3 and 4 numbers and dates, and The Daily Number Buster allows you to print detailed reports and charts of game statistics, recorded numbers and position hits. These reports become the basis of future picks and daily strategies. And of course, Daily Number Buster makes it easy to determine HOT, DUE and AVERAGE winning numbers!

Each 3 and 4 number game includes all straight and combination bets and unlimited number BOXING bets. You also get a complete explanation of odds and a handy Odds Chart for instant reference. Start winning more of those lucrative daily games with the most comprehensive, easy to use software product of its kind -- the all-new Daily Number Buster!

## Lottery Tracker & Wheeler Version 4.0

The Complete Lottery Tracker & Wheeler gives you the ability to track and play as many lotto games as you want, it provides the tools to produce charts, stats, reports and your own customized programs for the world's most popular number wheeling systems. And now you can create trend charts, analyze past winning numbers any way you like, produce accurate statistics on frequency, recency, bell curves, percentages and "hot" or "due" winning numbers.

### Designed by the Pros.

Lottery professionals and enthusiasts agree that The Complete Lottery Tracker & Wheeler is the one system powerful enough for the serious player. They play many state lotteries on a consistent basis, carefully tracking the results and formulating winning strategies. The developers of The Complete Lottery Tracker & Wheeler listened to what they had to say about the science of winning lotteries and incorporated a lot of their techniques into this new version.

### Check for Winners.

The new Check for Winners addition to the Tracker and Wheeler program is useful as another analysis tool, or, simply, to review your database for past winning numbers against tickets you have purchased, but have not checked. Select from 3 to 18 numbers for your search as well as the number of drawings to go back in your lottery database.

### FREE BONUS 'Lottery Winning Strategies' Audio Cassette!

*Learn What The Big Winners Know!*

We're also very proud to introduce the all-new "Lottery Winning Strategies" audio cassette, containing new information, new strategies, new tips and techniques. It's FREE when you buy The Complete Lottery Tracker & Wheeler.

### In Use Around the World!

"The COMPLETE Lottery TRACKER and WHEELER" is sold in all 50 U.S. States and 23 foreign countries. You can be confident that you are using a tested and accepted tool for "handicapping" (TRACKING) and WHEELING lottery numbers.

### FREE BONUS!

**Coupon for a Free "Winning Combinations" Database Inside Daily Number Buster and Complete Lottery Tracker & Wheeler**

A history of winning numbers in your state!

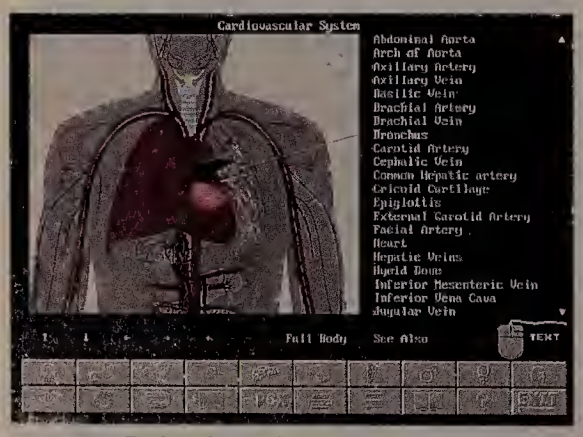
### LOTTERY SYSTEMS

BL3615 Daily Number Buster 5¼" & 3½" . . . . $49.95
BL3610 Lottery Tracker & Wheeler 5¼" & 3½" $49.95
*IBM PC, XT, AT, PS/2 and compatibles. Requires 256K.*

# Guided Tour of the Human Body.

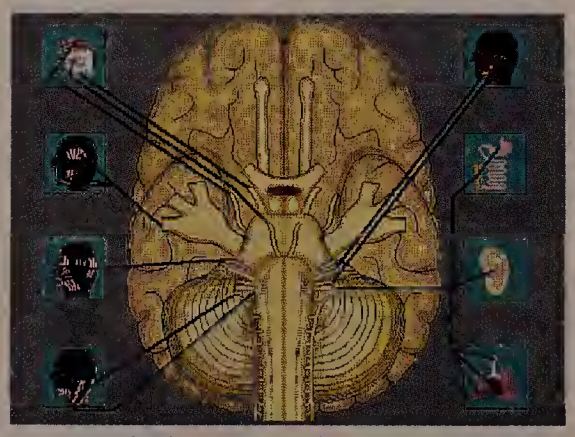
**The Human Anatomy System For Your PC.**

The human body. A perfect machine. It grows and develops, protects and heals itself and is designed to last for decades. Now the wonder of the body is combined with the power of the PC to produce a fascinating journey into its structure and functions. You'll see detailed, full-color graphics of the entire human body and a comprehensive database of facts, descriptions and explanations. Do you know the exact function of the hypothalamus? How about the kidneys? How do bruises heal? How does the brain work, and where is your duodenum? Experience a world of knowledge and beauty that provides profound insight into life itself. It's called BODYWORKS, and it could be the most interesting software program you'll ever own — perfect for students, artists and hobbyists.




*Explore the cardiovascular system...*

You begin by exploring the major body systems: select the skeletal system and view the bones and how they work, the joints, mechanics of the ball and socket. Select the muscular system and see the tremendously resilient human muscle, capable of developing enormous strength. Discover how the delicate muscles in the eye allow instant focusing and movement, far beyond the capabilities of even the most sophisticated camera. Move to the nervous system, and how the signals sent to the brain can detect even the slightest touch to the skin. Learn about how your nervous system allows the brain to instruct the body to perform complex movements — like walking! Then select the digestive system -- the body's systematic breaking down of food. Its incredible ability to process and extract nutrients. From the mouth to the intestines, BODYWORKS shows you in great detail how your body nourishes itself, how it accumulates fatty tissue (and how it uses fat).



*...Or discover the workings of the brain.*

There are complete sections on lymphatic, endocrine and cardiovascular systems. Explore the most amazing four-square-inches of tissue man has ever seen -- the human heart. How it feeds the body with a constant supply of necessary chemicals to sustain life. You'll learn how the human heart can be damaged, and exactly what happens when someone suffers a heart attack.

When your child asks "Where do babies come from?" you can simply select the section on the human reproductive system for a clinical explanation of the process.

You'll see all of the organs and tissues of the body, each described in exhaustive detail. Colorful graphic screens also provide information on sports injuries, first-aid advice on illness, insect and animal bites, along with other topics. This program is simple to use, just click or select any organ or system for instant retrieval of BODYWORKS' thousands of facts. A must for the home computer.

### BODYWORKS

BL4101-5 BODYWORKS 5¼" . . . . . $79.95
BL4101-3 BODYWORKS 3½" . . . . . $79.95

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# A World of Information on Your Desktop!

### Random House Encyclopedia

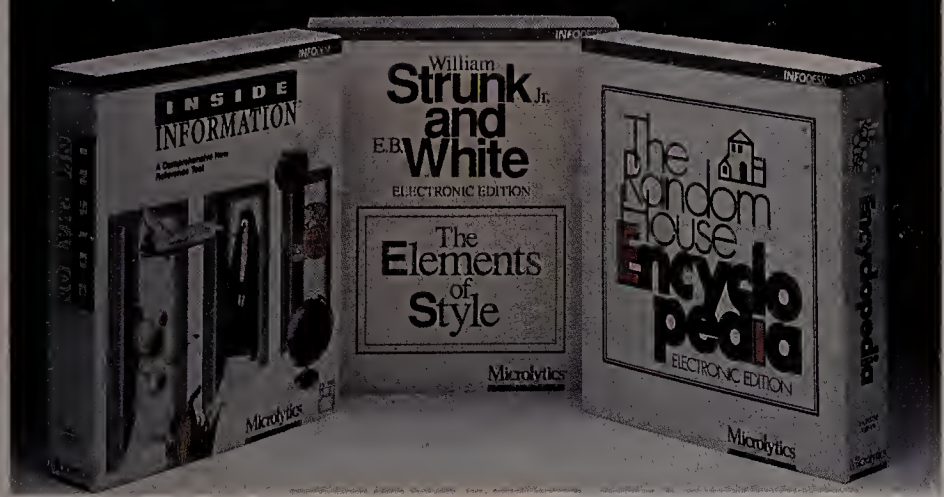
The best-selling encyclopedia that puts a full-blown reference center right on your PC! Simple and fun to use — without a CD-ROM player. Ideal for students, professionals, researchers, writers and a wonderful gift for any student. Just click to explore History, Geography, Philosophy/Religion/Mythology, Social Sciences, the Arts, Science, Sports and Leisure, Law, Government and more.

Using the powerful, built-in search and retrieval tools, you can see a quick overview of Chinese history, the advent of computers, facts about Romanian agriculture or learn how a nuclear power plant works. Click on Sports and learn about Ty Cobb, Hank Aaron and the immortal Babe Ruth. Click on Science and travel back to July 20, 1969 and Neil Armstrong's historic moon walk, or click on aircraft and span decades from Kitty Hawk to the present. Click on Leisure and travel through the careers of Elvis, the Beatles and others. Click on Government and explore the lives of George Washington, Thomas Jefferson, JFK and others. It's fast, easy and fun — ready to go right out of the box.

### Inside Information

This new Desk Accessory is a comprehensive reference tool which organizes the English language into logical Categories of defined words. Far more than a dictionary or thesaurus, INSIDE INFORMATION lets you quickly and easily explore any of seven general Classes: Nature, Science & Technology, Domestic Life, Institutions, Arts & Entertainment, Language, and The Human Condition. These Classes contain 20 Subclasses, 125 Categories, and 700 Subcategories.

**Buy Random House Encyclopedia and Elements Of Style — Get Inside Information FREE!**




Categories are defined by subject matter, such as Chemistry, Law or Music — or by a common property, such as Colors, Tools, Verbs of Motion — or even a specific usage, like Insults, Slurs & Epithets.

Dig deeper into each Class in three different ways: outline view, graphic view or tree view. The reverse dictionary lets you type a few descriptive words then see a listing of appropriate terms and definitions.

### Strunk & White's Elements of Style

Reviewers have called it "...the best of its kind" and raved, "The work remains unparalleled, direct, correct and delightful." Now **The Elements of Style** is available for your Apple Macintosh or IBM PC compatible computer.

Based on an original work by William Strunk, Jr., a Professor of English at Cornell University, this updated third edition, prepared by noted writer and grammarian E.B. White, has become a classic of conciseness. It's the ideal tool to make your writing crisp, succinct and powerfully effective.

Anyone who needs to communicate effectively in writing will find *The Elements of Style* packed with specific, pertinent examples to improve writing style and structure. It's an easy-to-access educational reference work for the rules and principles of correct English usage. Includes seven rules of usage, eleven principles of composition, several matters of form, a list of often misused words and a style guide.

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| BL3600 **Elements of Style** 5¼″ & 3½″ | **$59.00** |
| BL2600 **Elements of Style** *Mac* | **$59.00** |

## Add Sound To Your PC!

What's it all about? MultiMedia? Audio boards? I can tell you that it's not just for professionals anymore! Now, with Media Vision's easy-to-use, low cost audio systems, you'll hear the blast of rockets, the screech of tires, listen to soundtracks and special effects built into games and other software! You can record, edit and playback your own sound files (up to 22KHz). You can use synthesized instrument sounds for use in presentations. Mix different sounds and effects. The power of your PC makes it simple!

### The Thunder Board™

This sound card slips into your PC and brings with it on-board capabilities for digital recording and playback. You get a built-in joystick port and amplifier. Thunder Board reproduces all digitized sounds: speech, music and sound effects and records any sound through the input microphone jack. Its dynamic filtering provides low-noise, digital recording and playback, compatible with AdLib and Sound Blaster. There's audio compression, and the synthesizer can play up to 11 simultaneous instrument sounds to deliver rich music and spectacular audio effects.

Thunder Board includes Thunder Master software which allows you to modify and enhance the files you create. Record and playback (up to 22

KHz); mix pre-recorded sound files; change sample rates; edit wave forms; compress and decompress sound files; add special effects.

### Pro AudioSpectrum™

This single audio card transforms your computer into a full Microsoft Level 1 multimedia platform. One card — mega sound, with plenty of built-in instrument sounds, noise reduction features, studio and special effects, mixing features, output amplification — even a music clip library (jazz, pop, rock, classic and more!). It's fast, easy and fun. Record soundtracks, voice overs and more from a variety of stereo sources. It's even MIDI compatible.

**MediaVision**

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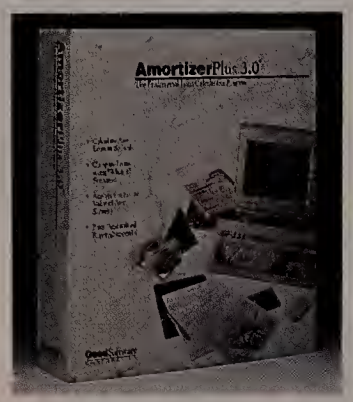
|---|---|
| BL6816 **Thunder Board** | **$169.00** |
| BL6818 **Pro Audio Spectrum** | **$389.00** |

**Thunder Board** *requires 512K RAM minimum.* **Pro Audio Spectrum** *(Dual media) requires 640KB RAM, 720KB or 1.2MB disk drive (low density format available)*

## Instant Loan Calculations!

If you are planning investments, preparing taxes, negotiating a lease or mortgage, or evaluating consumer loans, Amortizer Plus takes you from data input to detailed output in seconds.




Amortizer Plus offers the simplicity of pull-down menus, pop-up windows, and context-sensitive help. In minutes you will be calculating sophisticated multi-phase loans, leases and investment analyses.

### Calculate Loans Instantly.

Quickly and easily calculate, evaluate, and compare a variety of financing options such as fixed and variable interest rates, interest or principal only, balloon payments and more.

Set compounding and payment intervals independently. Select 360 or 365 day years, fiscal or calendar years ends, and last payment rounding preferences.

Enter the known variables and Amortizer Plus solves for the unknown variable. Easily investigate "what-if" scenarios. Just change loan assumptions and results are recalculated automatically. Quickly determine a note's yield if sold or repaid early, or see the loan balance at any specified date with the push of a button.

### Plan Financial Investments

Creating a retirement, college tuition, or wealth building plan? Amortizer Plus helps you analyze the effect of compounding and changing interest, deposits, and withdrawals on the future balance of any security. Or specify the desired future value goal and calculate the needed interest rate or deposit amount to reach that goal.

Leasing equipment or a car? Amortizer Plus helps you determine the appropriate lease terms. Specify the known variables and Amortizer Plus solves the unknown variable.

View reports on-screen, print them, or write them to disk in ASCII or .DIF formats for inclusion in Lotus 1-2-3, Quattro Pro, Excel, etc.

**WINDOWS VERSION NOW AVAILABLE!**

**Amortizer Plus**

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|---|---|
| BL4300-5 **Amortizer Plus** 5¼″ | **$79.95** |
| BL4300-3 **Amortizer Plus** 3½″ | **$79.95** |

*IBM PC, XT, AT, PS/2 or compatibles; 640K RAM; DOS 2.0 or greater. Hard disk recommended.*

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# After I Bombed with dBASE, I Almost Gave Up Automating Our Invoices...

Simpler Than dBASE and Paradox — More Powerful Than Q&A!

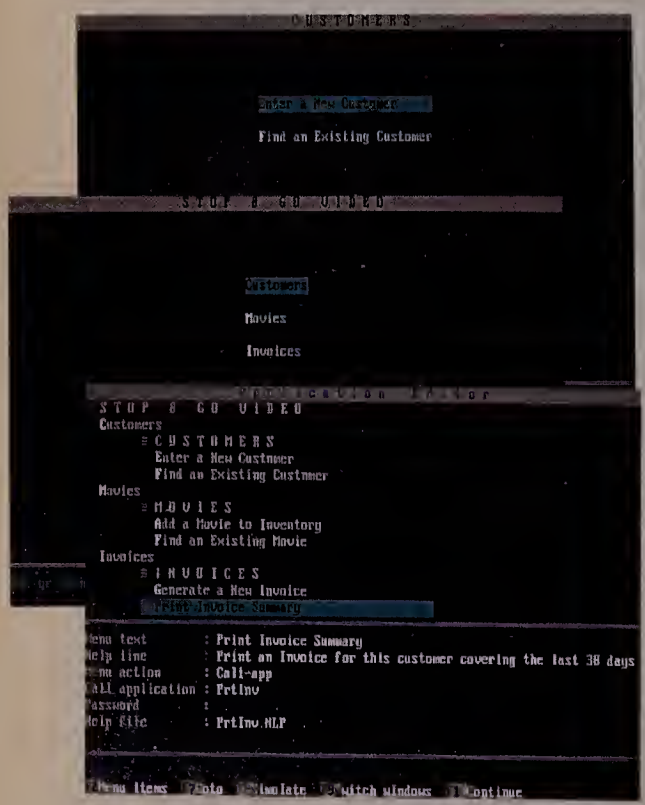
At our Monday morning staff meeting, I announced I was going to automate our invoicing system later that afternoon. Skepticism ran high. "Paul, you promised me an application like that two years ago," said Marge. "You couldn't do it and neither could that dBASE programmer you hired. It'll never happen."

On the other side of the room, Tim, a new employee whispered to Richard, "I didn't know the boss was a programmer too." "He's not," said Richard. "Couldn't write code to save his life. But he keeps trying because he thinks it's vital to the business."

I had already tried three times before to program a database: first with dBASE (much too complicated). Then I tried Q&A (not powerful enough). Then I bought Paradox (just like dBASE). All were either too complicated or not powerful enough.

This time I was confident. Why? Because I just bought Alpha FOUR, the powerful database for non-programmers like me. I spent 45 minutes over the weekend with Alpha FOUR's audio cassette tour. So I knew how easy application designs with Alpha FOUR would be, even the first time. I knew within hours, I'd be able to build a fully relational customer tracking and billing system, complete with custom menus, beautiful screens, extensive help messages and automatic error-correction for trouble-free data entry. And that's exactly what I did. You should have seen Marge's face when the first, perfectly formatted invoice came off the printer!

### I Developed My Application in Minutes.



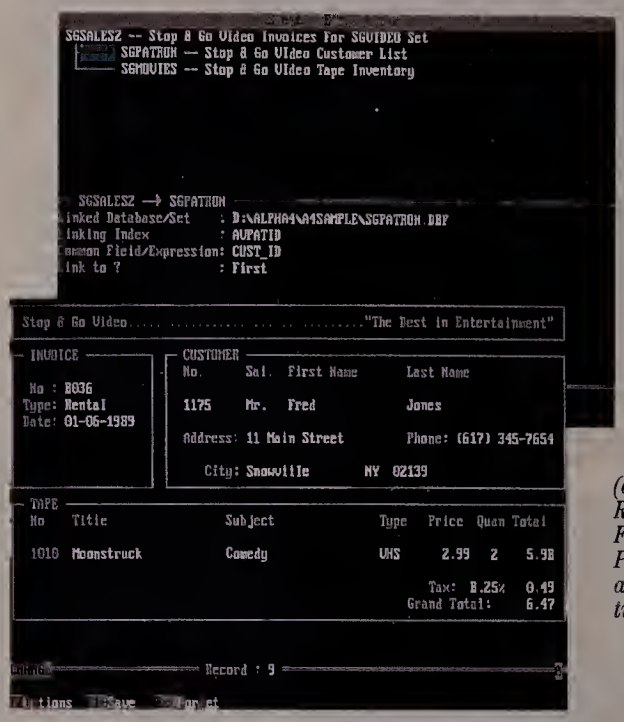

First, I needed a system of menus and sub-menus. Was I ever surprised to see how easy that was! With Alpha FOUR's "Application Editor" I wrote an outline of my menus and sub-menus. (Look at the screen.) Alpha FOUR automatically created my multi-level menus right from there. Changing my menus was just as easy. I inserted and moved a few around until I got it just right — nice and simple for my new employees.

### I Made My Data Entry Bulletproof.

I've got a high employee turnover rate, so I needed something simple that a new hire could run right from the screen. I wanted my system absolutely safe and secure, so no "accidents" or mistakes could damage the data I've worked so hard to gather. That's when I really started to appreciate the well-thought-out way Alpha FOUR works. The "validation" capabilities ensure data gets entered correctly. I set it up so Social Security numbers must be 9 digits long (otherwise a custom error message is displayed).

When I enter a new customer, Alpha FOUR automatically skips over unneeded fields (determined by my validation rules). And best of all — I use "lookup" fields whenever I can. So when I get to the "Customer Type" field, a window pops up with my choices. All I do is highlight and hit ENTER. No chance of an error!

### I'll Never Enter Data Twice Again.




I always ran out of power with other simple-to-use databases; they weren't relational, meaning I couldn't link up separate files that share a common field. But with Alpha FOUR I easily created different databases for customers, invoices and inventory, and linked them all together just by drawing the links between the databases on the screen. (Look at my screen.) Now, we never have to enter the same information twice. I can display and edit information from up to 10 databases on one screen all at the same time. Before, when I changed a customer's address, I had to do it in 3 different places. Never again. And my database files are so much smaller now — because the actual data is only stored in one database.

### Forms and Reports Look Great!

Alpha FOUR's Report Writer was even more impressive. I "painted" reports and invoices on-screen. They looked exactly like I wanted them to — much better than our old paper forms. This "What You See Is What You Get" approach to report writing gives me the flexibility I need to create meaningful and detailed reports that really get my point across.

**SPECIAL PRICING**
**$549 VALUE JUST $99.00!**

### Totally dBASE Compatible.

I was delighted to hear Alpha FOUR is totally compatible with dBASE .dbf files. Our mailing list went right into the new application without even having to be converted! And when my Alpha FOUR application grows, it'll import those Lotus 1-2-3 files used over in accounting. In fact, Alpha FOUR can import and export Lotus 1-2-3, Symphony, VisiCalc, PFS, MultiMate, WordPerfect and other packages.

### And Now I Get Fancy...

First I breezed through the tutorial just to get a fully operational application, but now I have the time to dress it up and make it fancy. First I'll change my menus to 3D boxes for the menu selections, and change some of the colors here and there. Alpha FOUR makes it all so easy. Then I'll customize some of the data entry screens so they look just like the paper forms the employees are used to working with. I know — I'll call up Alpha's free Bulletin Board Service and get some tips from other Alpha FOUR users.

In the future, I'll use Alpha FOUR's "Documentation" program to print out a full report of my database design, complete with all the details. That way, someone else can pick up where I left off and further expand the system.

**SAVE $450 With This Ad!**

## NOW JUST $99!

If you already have any database software, integrated package* or mail list manager, or if you are currently using your spreadsheet to manage data, you can upgrade to Alpha Four for just $99.

**Qualifying packages include programming databases (dBASE II, III and IV, Paradox, Clipper, Foxbase Fox Pro, Revelation, etc.), flat-file databases (Q&A, PFS:Professional File, Rapid File, etc.), integrated packages (Microsoft Works, PFS:First Choice, Lotus Works, etc.), and mailing list managers (FastPak Mail, etc.) or spreadsheets with databases (Lotus 1-2-3, Quattro Pro). Retail price $549.*

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**Alpha FOUR Version 1.1**

BL3455-5 **Alpha FOUR V1.1** 5¼" ..... **$99.00**
BL3455-3 **Alpha FOUR V1.1** 3½" ..... **$99.00**

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### Indispensible Reference Tool.

World Atlas is an ideal reference tool for travelers, educators, business people, librarians and students. It's an indispensible guide that brings together all types of important information that would take months to research and assemble. New version 2.0 includes conversion tables for currency, weights and measures; city to city mileage indicators; and local time and date information (World Atlas is the only program that adjusts for daylight savings time!)

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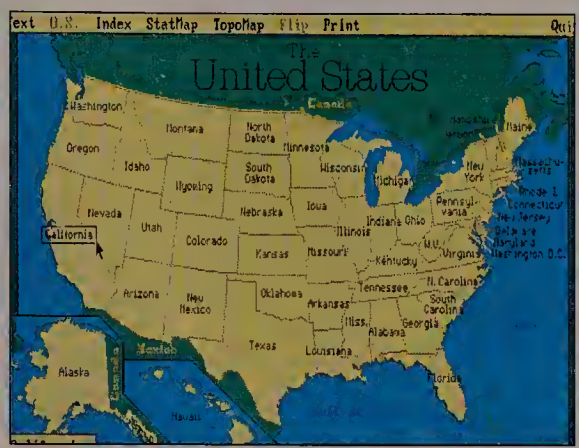


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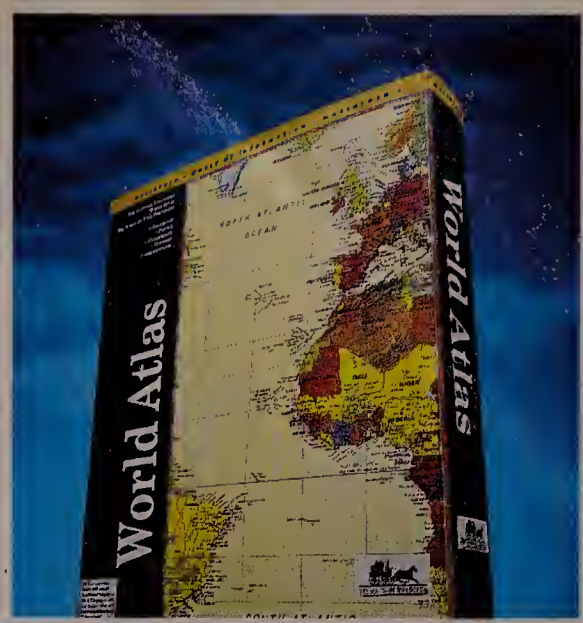


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Sophisticated in presentation, it facilitates in-depth understanding by matching Windows' commands, visual displays, and dialog boxes to clear, concise explanations.

### Perfect For Beginners and Intermediate Users.

WIND•EASE gives you a thorough understanding of Windows 3.0. If you're new to the environment, you'll quickly grasp the rudiments and progress quickly through its many advanced features. If you're a current Windows 3.0 user, you'll find loads of information on features you may never have used before. It's also fun to use WIND•EASE. With WIND•EASE, learning Windows is enjoyable and so will be using it.

### More In-Depth Than Even The User's Guide.

As you quickly learn Windows you'll discover WIND•EASE actually takes you beyond the user's guide. Here, you'll learn how to install and use other applications, how to quickly and easily set up networks, printer and fonts, how to create time-saving macros, how to customize PIFs, and use MS-DOS Executive. There's dozens of tips and techniques for using Windows 3.0 to its fullest.

WIND•EASE is a rich graphical program with *18 distinct program-segments*, designed to isolate and teach you window concepts. Study at your own pace and direction!

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- Basics (for beginners)
- Program Manager
- File Manager
- Print Manager
- Write
- Terminal
- Paintbrush
- Clipboard
- Control Panel
- Setup
- PIF Editor
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- Recorder
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- Cardfile

The program is structured for ease of use and thoroughness. *Consequently, it is ideally suited for corporate training programs*, at home/office users, and even the first time Windows user. And, because WIND•EASE runs under Windows, it is always there if you need instantaneous assistance!

WIND•EASE is your fastest key to unlocking all that Windows can do for you!

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**MacUser Magazine, Sept. 1991**

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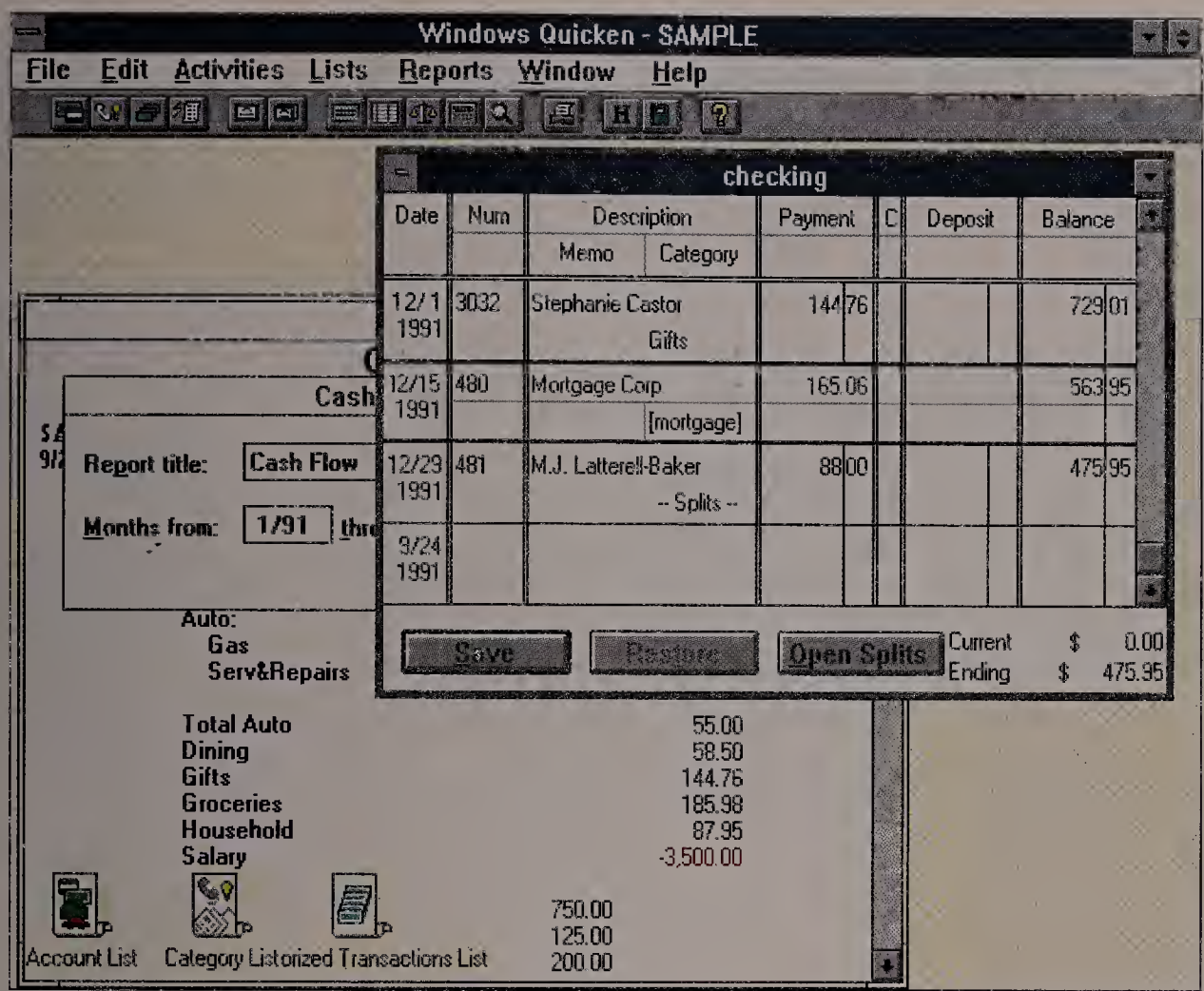
**Circle 317 on reader service card**

# Bill Paying Quickens

*Quicken 5.0 picks up shortcuts and additional smarts, while the Windows version sets more modest goals.*




**Quicken for Windows multitasker lets you keep any number of check registers and reports open on screen simultaneously, with Quicken lists iconized below for quick reference.**

*Mike Hogan*

What could be more fun than sitting down every month to pay your bills? Balancing your checkbook, maybe? Intuit's *Quicken 5.0* and *Quicken for Windows* may not make these chores a chuckle, but they certainly can ease the pain.

*Quicken*'s no-hassle checkbook interface and low price have made it the preferred solution for automating routine personal finance chores and tracking investments. Yet it packs enough functionality to be used by small businesses for single-entry accounting. DOS-based *Quicken 5.0* adds mouse support and more familiar Quick-Key shortcuts for navigating data. This version is also smart enough to guess your next action and charitable enough to forgive you for hitting <Enter> instead of <Tab>. Tutorials give you several ways to learn.

Unlike previous versions, *Quicken 5.0* lets you see the reports you're designing and assign multiple subcategories to income and expenses for more informative reports. For example, you can track costs for fuel, loan, and service under your Auto category. A new QuickZoom feature gives you instant detail on line items, and you can create a budget of future income/expenses using the past 12 months' data.

### And Windows Too

*Quicken for Windows* lacks most of *5.0*'s enhancements, although *Windows* eliminates the need for some of them. You won't need QuickZoom since you can keep checking, savings, and investment registers on screen while you transfer funds or develop financial reports. *Quicken for Windows* gives you *Windows* fonts in your reports and a customizable desktop where you can pop up, say, checking and credit card icons at the beginning of each session.

Both versions let you process a series of transactions in a batch. *Quicken* gives you warning of due dates. And as before, you can split a transaction, such as a mortgage payment, so that a portion is assigned to principal and a portion to interest (which is tax deductible and should be reported to *Quicken*'s tax module). In fact, *Quicken 5.0* adjusts the amortization to reflect the amounts that go to principal and interest.

If you've standardized on *Windows*, *Quicken for Windows* will do the job, but *Quicken 5.0* is a better version of this old favorite.

*Mike Hogan is a senior editor for* PC World.

## SNAPSHOT

### Quicken 5.0

Shortcuts and mouse support keep the personal finance leader on top.

**KEY FEATURES**

- **More Quick-Keys and other ease-of-use enhancements**
- **More flexible report generation**

### Quicken for Windows

WINDOWS No match for the DOS version, but a fine alternative for *Windows* users.

**KEY FEATURES**

- **Keep multiple accounts and lists open on screen**
- **Customizable desktop**

**AVAILABILITY**

Immediate

**PRICING**

*Quicken 5.0* $69.95, *Quicken for Windows* $69.95

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What's the big deal about multimedia anyway, you ask? Well, for starters; sound, music and visuals enrich business presentations beyond your wildest expectations. Interactivity lets you tailor your communication, precisely—to fit each audience's specific interests. And features like CDPC's external volume control, built-in speakers and microphone make presentations a breeze. Plus, with CDPC, applications like MacroMind's Action!, Animation Works and Asymetrix ToolBook help your business presentations take on even greater depth and dimension. And it's no surprise that multimedia is a teacher's dream come true. It entices, enlightens and entertains—and everyone knows that entertainment is the best form of communication—especially when used with applications like Compton's Multimedia Encyclopedia, Bookshelf for Windows and The Berlitz Foreign Language Series.

(Say adios to boring instruction, hello to dynamic learning experiences.)

So, if you're playing games, or playing music, your PC can once and for all be heard. Loud and clear. PC games, for example, get so highly-fueled with sound, they're down right explosive. Characters come roaring to life. Plus, CDPC is Sound Blaster and AdLib compatible, helping you access virtually all your favorite software. Like Battle Chess, Wing Commander, Jones In The Fast Lane, you name it.

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# PRODUCT OUTLOOK

*Edited by* MIKE HOGAN

Momenta Computer

## Notebook Takes an Express Ride With Pen Central

**Momenta gives you a go-anywhere platform with a suite of built-in applications you can direct with a simple pen point.**

Pen-based computing promises direct action: By using a pen on the PC screen, you'll be able to issue commands faster and more easily than with a keyboard or mouse. You'll also be able to take actions impossible with most PCs, such as marking up a fax and instantly sending it back, or unobtrusively taking notes in a meeting.

The Momenta Computer starts with a 6-pound 20-MHz 386SX notebook that accepts input on screen. Its well-integrated operating environment includes address book, spreadsheet, calendar, presentation graphics, freehand note taking, charting, fax, and word processor plus desktop utilities. These applications have helpful touches like deferred transmission (finish a fax now, and the system sends it automatically when a phone line is attached), but *PC World* saw prototypes only.

Momenta has been designed to minimize the need for handwriting recognition—sensible, since this technology still has a ways to grow. Unlike its peers, the Momenta has an on-screen "command compass" that shows you how to perform actions such as cutting or copying simply by touching an object and *gesturing* (moving the pen) in a given direction, rather than forcing you to memorize a new vocabulary that involves more elaborate pen gestures.

Several third-party vendors will offer Momenta applications, and customers can grow their own with a Smalltalk-based development environment. Alternatively, flip the screen up, attach the keyboard, and run existing DOS and *Windows* applications. Momenta will add support for Microsoft's *Windows for Pen Computing* when that arrives.

The system comes with a 40MB hard drive (larger drives are available), 4MB of memory expandable to 8MB, an integrated fax-modem, and file transfer cable, for a list price of $4995. A reflective 10-inch VGA LCD screen is also standard; a backlit version will be offered early next year.

State-of-the-art power-saving techniques let you run the system for 6 hours on nickel-cadmium batteries that recharge in 90 minutes. However, battery life will drop if you choose the backlit screen. The system slips into a dashing black case, but take pen in hand to make sure it's right for you before signing the check.

—*Eric Bender*

### IN BRIEF

**Momenta Computer**
This powerful notebook should be an impressive system when it's polished for shipping.

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295 N. Bernardo Ave.
Mountain View, CA
94043
800/666-3682,
415/969-3876
**Reader service no. 825**

### INSIDE PRODUCT OUTLOOK


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124 **By Design 2.0, By Design for Windows** Turn DOS *WordPerfect* into a no-fuss desktop publisher, or add new DTP talents to *WordPerfect for Windows.*

124 **PSX** Seiko's thermal transfer printer gives color without sacrificing speed.

128 **LANSpool 3.0, LANSpool Fax, Net SatisFaxtion 1.0** A trio of Intel products makes sending a PC fax as simple as printing a document.

130 **IBM PS/1 386SX** New power and expandability give this homebody the punch for business applications too.

130 **Object Vision 2.0** Borland's forms manager gains big-league data handling talents and lets you fine-tune the look and content of forms.

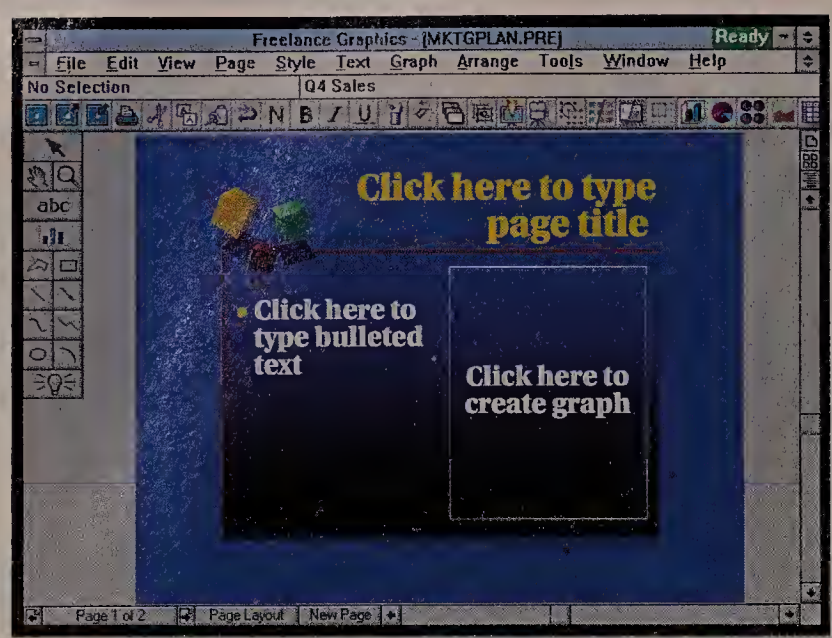
136 **Paradox SE, Quattro Pro SE** No-nonsense versions of Borland's best-sellers for under $100.

137 **Lexmark PPS II 2380, PPS II 2390** Durable, reasonably priced dot matrix printers from IBM spin-off.

138 **Harvard Draw for Windows 1.0** Sophisticated illustration package is quick on the draw.

Freelance Graphics for Windows

## Getting Into the Swim With Windows




**Unlike its DOS cousin, this Windows presentation package lets you make global changes in format, style, color, and so forth easily.**

*Freelance Graphics* takes to *Windows* like a fish to water. You get a WYSIWYG display, more powerful and flexible graphing than the DOS version's, and a grab bag of enhancements for ease of use, most significantly the ability to make global changes.

Like Microsoft's *PowerPoint, Freelance Graphics for Windows* employs the pasteboard metaphor, keeping all your slides and pages in a single file for easier simultaneous preview and manipulation than with its DOS-based version. You can work in the program's outliner or on the pasteboard, confident that any changes to a page are reflected in the outline, and vice versa.

*Freelance* gets you going with 60 modifiable master designs called SmartMasters that give a series of slides a consistent look and simplify global changes to format, style, and color.

The package offers small ease-of-use improvements over *PowerPoint*—for instance, you can undo your last ten actions—plus innovative features such as the ability to break apart objects, be they scanned in or selected from the 500-plus clip-art images that come with *Freelance*. Need an image of eyeglasses? Scan in a picture of a man wearing eyeglasses, and lasso just the glasses.

What really distinguishes *Freelance Graphics for Windows* is its preview capabilities during global redesign. Call up a list of SmartMasters, highlight the design you want and you see a sample of the effect that choice will have on your word charts and clip art. No more tedious loading of an item onto your work space only to find it wasn't really what you wanted.

The program provides nearly everything you expect in top-flight presentation programs—robust drawing tools, up to 256 colors per presentation, and gradient fills for objects as well as backgrounds. You can define an unlimited number of 18-color palettes and choose from 96 graph styles. You get a spelling checker and text-handling capabilities that include vertical justification.

You also get more than 100 "SmartIcons" for quick access to functions ranging from drawing tools to text operations such as justifying. Any combination of SmartIcons can be displayed on the desktop.

It would be nice if the program offered a title sorter as well as the slide sorter, since screen redraws are painfully slow. Tools for animating and evolving figures, and control of leading and kerning would also be welcome.

The program lists for $495, but you can get it for $49 if you bought a copy of the DOS version within six months of the *Freelance Graphics for Windows'* ship date.

*—Patrick Marshall*

### IN BRIEF

**Freelance Graphics for Windows**
WINDOWS *Windows* gives this longtime DOS favorite a new flexibility that makes it easier to create and change your presentations.
**Lotus Development Corp.**
55 Cambridge Pkwy.
Cambridge, MA 02142
617/577-8500
**Reader service no. 828**

Plus Impulse DriveKit

## Quick Storage for Micro Channel PS/2s

Today's *Windows* and other graphics-intensive applications take up so much storage that unless your system has something on the order of a 100MB hard drive, you're probably scrambling for disk space. Going graphical is particularly tough if you're one of the millions of owners of an IBM PS/2 Model 50, 50 Z, or 70. You're stuck with a slow 20MB drive for the original Model 50, or 30MB for the original Model 50 Z, and even the 386-based Model 70 lacks an extra hard drive bay for adding storage without swapping out your hard disk.

The Plus Impulse DriveKit for IBM Micro Channel systems is a slick solution to that dilemma. This fast 17ms SCSI hard disk with a 64K read-ahead cache can be added to the second floppy bay of any PS/2 except the Model 55 SX, so you no longer have to dump existing storage to add a new hard disk. (The 55 SX design requires swapping your hard drive out for the Plus Impulse DriveKit.)

In either case, installation is designed with you in mind: Just replace the old floppy controller connector, install the SCSI adapter, slide in the drive assembly, and run a quick software installation. Quantum expects this to take around 10 minutes.

The kits come in 52MB, 80MB, 105MB, 210MB, and 425MB configurations with list prices of $699, $799, $999, $1749, and $2999, respectively.

*—Rex Farrance*

### IN BRIEF

**Plus Impulse DriveKit**
PS/2 desktop users can add fast storage in an unused floppy bay without discarding their original IBM hard disk.
**Quantum**
500 McCarthy Blvd.
Milpitas, CA 95035
800/624-5545
**Reader service no. 839**

# The Great Crash Of '91.

Not long ago, the PC world was shaken by the news that a surprisingly well-known communications package had crashed while attempting high-speed file transfers. It was not a pretty sight.

After testing different comm programs, the editors of *PC Magazine* reported that *"Procomm Plus®* locked up several times during our testing of high-speed file transfers. During our Character-based ZModem tests, on an 8-MHz AT equipped with a 16550A UART, it consistently froze at every port speed faster than 38.4 Kbps on the receiving side of the link."

This episode proved that you can't be too careful before investing in comm software. It also proved, once again, that you can't go wrong with Crosstalk.®

# Crosstalk Cruises Through High-Speed Tests.

Not only was Crosstalk the one consistent benchmark throughout the

*PC Magazine* tests, but it was one which the editors of *PC Magazine* applauded for performance, price and flexibility.

As for the feature-rich Crosstalk Mk.4, the editors commented that "...it's a real bargain for all it accomplishes. Corporate managers who require features like a powerful script language, a variety of terminal emulation selections, and network communications capabilities will appreciate this product."

The editors of *Software Digest* drew a similar conclusion. They gave Crosstalk Mk.4 the only 4-star rating in their ranking of communications packages. And while Crosstalk Mk.4 proved to be an unparalleled program for power users, its sister product, Crosstalk Communicator, also scored highly in the *PC Magazine* tests. Crosstalk Communicator received points for "...matching its higher-end sibling, *Crosstalk Mk.4,* practically score for score." It provides "...a fast, flexible alternative for the budget-conscious, particularly anyone in an organization already using *Crosstalk Mk.4,* because it can use scripts developed in that program." Between the two of them, Crosstalk Mk.4 and Crosstalk Communicator can cover virtually any communications need you have.

# Why Risk It?

So, before you risk a high-speed crash, take some free advice. Get our free reprint of *PC Magazine's* comm software round-up (including the tests with high-speed file transfers) plus helpful information on choosing the right software for your particular needs.

Just call
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CROSSTALK

Another Communications Solution From DCA.®

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| PC WORLD BEST BUY | PC WORLD BEST BUY | PC MAGAZINE EDITORS' CHOICE | Software Digest |
|---|---|---|---|
| April 1991 Crosstalk Communicator | April 1991 Crosstalk Mk.4 | April 30,1991 Crosstalk Mk.4 Version 2.0 | ★★★★ Vol. 7 No. 12 1990 Crosstalk Mk.4 |

# How To Avoid A High-Speed Comm Crash.

Circle 62 on reader service card

By Design 2.0, By Design for Windows

## A Perfect Designer in Your PC

If you use *WordPerfect* to do desktop publishing, your dentist probably scolds you for grinding your teeth. While *WordPerfect for Windows* will make some publishing tasks easier, *WordPerfect 5.0* and *5.1* users no longer need wait for help in designing professional-looking newsletters.

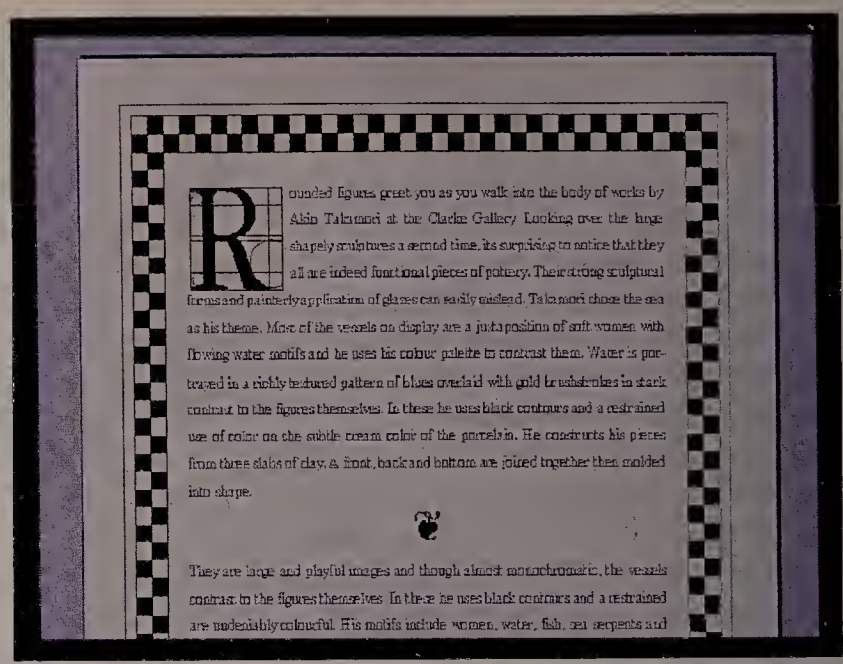
*By Design 2.0* is a desktop publishing program available for both *Windows* and DOS versions of *WordPerfect.* You can use *By Design* to produce all manner of designer-quality documents with a minimum of fuss. The program supports all the printer fonts available to you and lets you select from 65 classy, customizable designs for your letterhead, labels, resumes, page layouts, title pages, newsletters, tables of contents, fax cover sheets, and other documents.

You can get creative with your own designs using *By Design*'s tools, such as large graphic lead characters, page borders and headers, symbols for icons or bulleted lists, plus a library of 600 clip art images. *By Design*'s menus are available with a single keystroke at any time from within *WordPerfect.* A setting menu shows you a collection of matching tools and page layouts to assist in creating a logical, consistent design.

**IN BRIEF**

**By Design 2.0, By Design for Windows**
WINDOWS This add-on turns the DOS version of WordPerfect into a desktop publisher or brings still more graphics garnishes to WordPerfect for Windows.

**Streetwise Software**
1227 18th St., Ste. B
Santa Monica, CA
90404
213/829-7827,
213/828-8258 (fax)
**Reader service no. 831**




**Now you can design newsletters and other small desktop publishing projects from within the familiar environs of WordPerfect.**

With the *Windows* version of *WordPerfect,* you can even use *By Design*'s rudimentary drawing tools right from the *WordPerfect* menu without having to import drawings via the Clipboard. *By Design for Windows* also provides page backdrop and text layout tools.

In the DOS version, you have to go to Print Preview to see what you'll get, but *By Design* improves this dismal situation by putting helpful comments on the text screen and not actually making a change until you okay it.

*By Design* may not give you all the desktop publishing artillery of *PageMaker* or *QuarkXpress,* but its design galleries can give your *WordPerfect* documents a polished look. And at $99, it's a lot cheaper than the services of a real live graphic designer.

*—Bronwyn Fryer*

PSX

## Seiko Printer Gives Color With Speed

There are plenty of printers like Seiko's PS that let you put a little color pizzazz into your spreadsheets and desktop presentations. But Seiko's new thermal transfer PSX lets you do it at least 30 percent faster than the previous model.

The PSX includes a 25-MHz RISC processor instead of its predecessor's 16-MHz chip. It also has more memory uniquely configured to relieve the bottlenecks that occur during both the transfer of large graphics files from PC to printer and the description of those pages. Your PC won't be tied up for those interminable waits typical of color printers, because the PSX decouples the output and print functions.

Instead of the PS printer's 40K buffers, the PSX assigns up to 3.9MB of memory as needed to each of its serial, parallel, and AppleTalk ports. Seiko has increased standard RAM to 10MB on the PSX Model 4 and 18MB on the PSX Model 14. But with third-party SIMMs, either can be expanded to 34MB, up to 17.4MB of which the printer partitions automatically to accommodate multiple pages.

Seiko has also addressed the long wait on the network queue. Instead of working on pages on a first-in, first-out basis, the PSX processes the first complete page to hit the queue. That means if a 12K memo arrives after a 24MB graphics page has begun transfer, the short page will print first. This shared printer can be hooked up to both NetWare and ethernet network bridges and features a 250,000-page life cycle—about six years of use at 35 percent of the workday.

Of course, the PSX's speed will cost you—$9499 for the Model 4 and $12,999 for the Model 14. But you can upgrade from the PS for the price of the controller—$3000 for Model 4 and $3500 for Model 14. Those controllers include the PS printer's 300-dpi resolution and PostScript Level 1, and in the future should include an upgrade to PostScript Level 2.

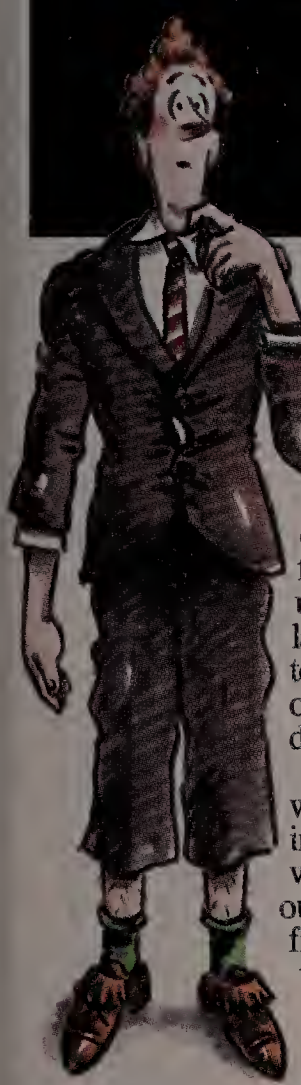
*—Susan Lusty*

**IN BRIEF**

**PSX**
This thermal-transfer printer adds processing power, memory, and clever task-juggling techniques so you don't have to give up speed for color.

**Seiko Instruments USA Inc.**
1130 Ringwood Ct.
San Jose, CA 95131
408/922-5800,
408/922-5840 (fax)
**Reader service no. 830**

# Why So Many Communications Users Can't Fit Into Their Software.



It seems like no one fits into their comm software anymore. Your company's power users can't squeeze into programs that scrimp on high-performance features. Yet, your casual modem users and laptop users can't afford to be swamped by scores of power features they don't need.

To make matters worse, if everyone brings in their own comm software, PC anarchy breaks out and then nothing fits! You're left with a tangle of incompatible packages from the sloppiest shareware to the most sophisticated software. You can't share scripts. Can't share support and training. Can't easily share much of anything!

What you *can* do is take a closer look at the Crosstalk® family of products.

## Crossing The Communications Gap.

Crosstalk Mk.4 and Crosstalk Communicator not only let you fit the right software to the right users, but both comm programs actually work as a team. Since the two programs share the same code base and menu system, users can easily move from one to the other. Training and support are simplified. And complex scripts can be written on one, yet run on the other.

With both packages, you get the engineering excellence for which Crosstalk is famous–and the kind of support and back-up that only come from a company like DCA®.

> *"If you develop scripts in Mk.4 but your coworker prefers the easier-to-use Crosstalk Communicator, that's fine. You can use the same scripts with Communicator."*
> *–PC Magazine*

## The Most Fitting Solutions.

Crosstalk Mk.4 is the ultimate comm software for power users. When the editors of *PC Magazine* chose it as the top performer among all comm packages for 1991, they called it, "A top-notch program that does almost everything and does it all right..." It has the CASL™ scripting language (a powerful programming language like C or Pascal) for automating communications. Plus, highly specialized capabilities from VT™ emulators and ZMODEM to FTTERM and IND$FILE. Data transmission rates up to 115,200bps. Multiple sessions. And modem sharing on LANs.

Crosstalk Communicator is the favorite of executives and laptop users.

It's simple enough to configure and begin communicating in three minutes, yet includes so many of the same popular features as Crosstalk Mk.4 that *Info World* called it "an exceptional value...anything but stripped down."

Individually, Crosstalk Mk.4 and Communicator perform so well that *PCWorld* gave both products the "Best Buy" award in their respective categories.

Together, they provide an unbeatable solution that can be tailor-made to your users and budget.

## Avoid Nightmares Like The Great Crash Of '91.

*Get your free reprint of PC Magazine's comm software round-up (incl. tests on communications over high-speed modems). Call 1-800-348-DCA-1, ext. 84C.*

Some say it's worth specifying Crosstalk for the reliability alone. Remember April of '91 and the popular comm package that crashed repeatedly when *PC Magazine* attempted high-speed file transfers? Crosstalk was the benchmark for those very same tests.

So, if you're looking for the most reliable, fitting solution for *all* your comm users, look into Crosstalk. We'll send a free booklet to help you match the right Crosstalk programs to your particular needs.

For your free Communications Guide call

**1-800-348-DCA-1, ext. 84C.**

CROSSTALK

Another Communications Solution From DCA

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PC WORLD BEST BUY — April 1991 Crosstalk Communicator

PC WORLD BEST BUY — April 1991 Crosstalk Mk.4

PC MAGAZINE EDITORS' CHOICE — April 30,1991 Crosstalk Mk.4 Version 2.0

Software Digest ★★★★ Vol. 7 No. 12 1990 Crosstalk Mk.4

**Circle 84 on reader service card**

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**Circle 163 on reader service card**

LANSpool 3.0, LANSpool Fax, Net SatisFaxtion 1.0

## Print and Fax Servers From Intel

**Intel's new networking suite gives your work group print and fax services with plenty of management extras.**

Faxing is nothing more than remote printing, so sending a PC-based fax should be as easy as printing a document. That's the logic behind several Intel network products. *LANSpool Fax* is a simple send-only fax server that works with version 3.0 of the *LANSpool* print server utility, and *Net SatisFaxtion* is a high-end send/receive fax server.

*LANSpool 3.0* is a major upgrade to Intel's popular print server utility. Not only does it control networked printer use, ordering print jobs in queues, but its LANQview utility lets you view up to three print queues and reorder print jobs. Version 3.0 also adds printer diagnostics, support for *Windows* and multiple servers, and faster printing. *LANSpool* costs $395 per server for NetWare 2.1*x*, $595 for NetWare 3.1*x*, and $595 for *LAN Manager* or *LAN Server*. The upgrade from any prior version is $195.

*LANSpool Fax* is a software add-in to *LANSpool* that lets any user on a NetWare network send faxes using from one to eight shared Intel SatisFaxtion boards. You can't receive faxes, but the utility costs only $295 (for users who already own *LANSpool*), so you can afford to buy a separate fax machine for receiving and still spend less than you would for most fax servers. With *LANSpool Fax*, you can pop up a 5K RAM-resident utility over your current application, redirect printer output to fax format, and send it off on the spot. You can set up timed faxes for later delivery and include logos and signatures.

*Net SatisFaxtion* can send and receive faxes over a network. This $799 fax gateway supports all major networks. *Net SatisFaxtion* consumes 45K on each workstation (22K with expanded memory). It includes all the features of *LANSpool Fax* plus LaserJet II printer redirection, administrative queue management, and *Windows* support via the bundled *Faxit for Windows* from Alien Software.

You can pile on eight Intel SatisFaxtion boards per server, but unlike some fax gateways that support direct inward dialing and other routing techniques, *Net SatisFaxtion* requires an operator to route incoming faxes manually. The operator can view the cover sheet only, ensuring privacy. —*Eric Brown*

### IN BRIEF

**LANSpool 3.0, LANSpool Fax 1.0, Net SatisFaxtion 1.0**

WINDOWS The *LANSpool* print server adds queue management and *Windows* support, while the *LANSpool Fax* and *Net SatisFaxtion* servers are simple but comprehensive ways to share fax services.

**Intel Corp.**
5200 N.E. Elam Young Pkwy.
Hillsboro, OR 97124
800/538-3373,
503/629-7354
**Reader service no. 835**

Dr. Halo IV Paint and Imaging Pack, Halo Desktop Imager, Halo F/X

## A Low-Cost Way to Doctor Images

A picture may be worth a thousand words, but creating and managing that picture can cost thousands of dollars in software tools. Now Media Cybernetics offers three low-cost packages for image-capture and -manipulation.

Media's *Dr. Halo IV Paint and Imaging Pack* is five programs in one. You get the latest version of *Dr. Halo*—the popular DOS painting package—plus a screen capture utility, file viewer/converter, slide show module, and font editor, all for $139. An introductory deal offered through year-end lets you trade in your existing paint package and get the entire set for $49.

The file viewer lets you view a 24-bit color image on a normal 8-bit VGA display, print it, and save it as a PCX, TIFF, TGA, BMP, or *Ventura Publisher* IMG file. With the font editor, you can take any of *Dr. Halo*'s 31 bit-mapped fonts and customize the characters—good for designing logos or display type for presentations and newsletters. You also get 24 scalable fonts.

If you're married to *Windows* and already have *Windows Paint*, you can get the rest of the *Paint and Imaging Pack* suite in *Halo Desktop Imager*. For $139, you won't be getting a full-fledged image editor, but as with its DOS cousin, you can capture screens and convert files. You can also crop and size images, control contrast and sharpness, and adjust color values for 15 images at once.

Finally, the $299 *Halo F/X 1.2* fills in some gaps *Halo Desktop Imager* leaves in the handling of black-and-white images. This DOS-based package puts an electronic darkroom at your fingertips, letting you scan in black-and-white photos and retouch them. —*Daniel Tynan*

### IN BRIEF

**Dr. Halo IV Paint and Imaging Pack, Halo Desktop Imager, Halo F/X**

WINDOWS This trio of packages lets you create and manipulate images on the cheap.

**Media Cybernetics, Inc.**
8484 Georgia Ave.
#200
Silver Spring, MD 20910
800/992-4256,
301/495-3305
**Reader service no. 834**

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Circle 33 on reader service card

ObjectVision 2.0

## That Not-So-Obscure Object of Data

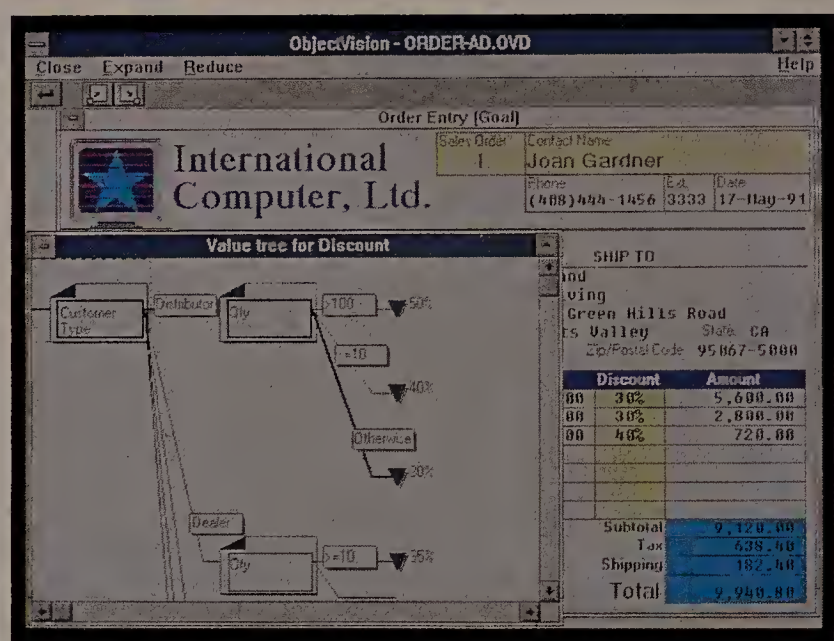
Despite all the wonderful forms you could create in *ObjectVision 1.0*, the first version of Borland's forms manager suffered from serious limitations. If you had to list multiple products in an order form, it was time to turn to a real data manager. Fortunately *ObjectVision* worked with *dBASE*, *Paradox*, and *Btrieve* files and could read data from any DDE-supporting *Windows* program.

Enter *ObjectVision 2.0* with a new feature called a *table object* that you can insert into a form to see and print all the records in one data file that relate to one record in another. Now you have a place to put those multiple products in your order form.

Queries and reports are also more workable. You can create query forms that let you access only records you need. Previously you could print only one form at a time; now a single command lets you print forms sequentially for all the records in a data base. By adding table objects to your print form, you can create complex and varied reports.

There are now two kinds of *decision trees*, the graphic tools for adding intelligence to *ObjectVision* fields. *ObjectVision 1.0* introduced *value trees* —decision trees triggered by the contents, or value, of a field (IF this field is < 0 THEN...). Version 2.0 adds *event trees* (IF the mouse clicks on this field do...). Among their other capabilities *event trees* allow you to set up an application where clicking a button or changing the contents of a field brings up another form. Borland has improved the forms designer too, giving you finer grids to work with, color control, and the ability to set fonts for field values.

*ObjectVision*, which costs $149.95, is still intended to support your other data management program, not to supplant it. But with version 2.0, you'll have fewer reasons to go elsewhere. *ObjectVision 2.0* can run on any system with *Windows*. —*Lincoln Spector*




**Borland's SE versions kick the price out of both Paradox and Quattro Pro with only moderate compromises in functionality.**

**IN BRIEF**

**ObjectVision 2.0**
WINDOWS Borland's intelligent-forms package can now handle heavy-duty data chores while giving you more control over the look of your forms.

**Borland Int'l, Inc.**
1800 Green Hills Rd.
Scotts Valley, CA 95066
800/331-0877,
408/438-8400
**Reader service no. 833**

IBM PS/1 386SX

## Built for Comfort, Not for Speed

If you bought IBM's original PS/1, you're probably reading the wrong magazine. IBM aimed that system at novice home users rather than *PC World*'s savvy veterans, leaving out most features business users need and producing an underpowered AT with a clumsy upgrade path. Most home-office buyers opted instead for cheaper but better configurations from respectable compatibles makers.

But now Big Blue is back with a revamped PS/1 that promises much more power and expandability in home, home-office, and even small business roles at a more realistic cost. The PS/1 386SX comes in two flavors, both with a 16-MHz CPU, 2MB of memory, a mouse, a 2400-baud modem, and the minimalist 12-inch VGA monitor that's your only choice (it holds the PS/1's power supply).

The C42 model is identical to the existing color PS/1 except for the CPU and 40MB drive. You get the same software: DOS 4.01, a DOS shell, *Microsoft Works*, and start-up kits for two on-line services—the Prodigy-based PS/1 Users Club (with three free months) and Quantum-based Promenade. The machine lists for $1699; IBM expects the street price to be $1399.

The high-end B82 comes with an 80MB drive in a taller, clunky-looking box but with two AT slots and an optional second hard drive. It features the same software bundle plus *Windows 3.0* and the *Windows Productivity Pack*. This model lists for $2199 but should sell for $1799. Pop off the cover with its one-button release, and you can add an 80MB for $1060 or a 129MB drive for $1500. The credit card–style memory upgrades come in $279 2MB and $549 4MB versions.

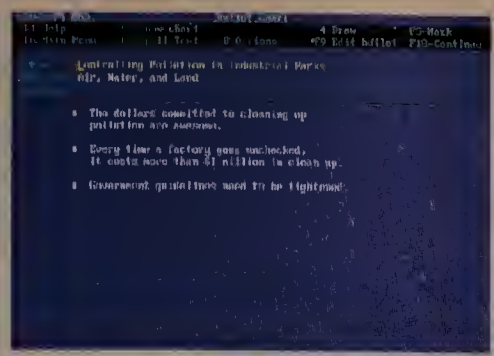
But the PS/1's real appeal is not features but comfort level. Everything comes in a single box and zips together quickly, and once you've brought it home, you can depend on IBM. If you have questions, you can dial in to the on-line Users Club or speak directly to IBM support folks. If something breaks, you can exchange it, and IBM will have a replacement on its way to you via overnight service within 48 hours. While IBM still charges a premium, these safety net services should assure some happy homecomings for the PS/1 386SX. —*Eric Bender*

**IN BRIEF**

**IBM PS/1 386SX**
The homebody PS/1 gets 386SX power and a better upgrade path while retaining the Big Blue security blanket.

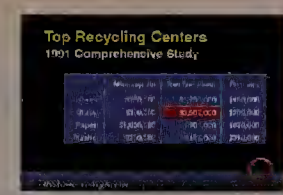
**IBM**
1133 Westchester Ave.
Mail Drop 262
White Plains, NY 10604
800/426-3377
**Reader service no. 826**

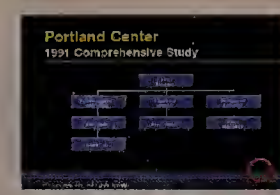
*Drawing tools. 39 in all.*



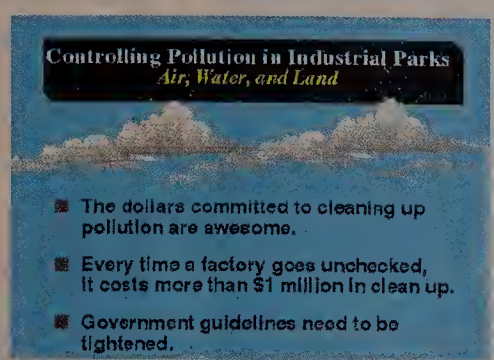
*Do what you've always done before…*

*Twist it. Turn it.*

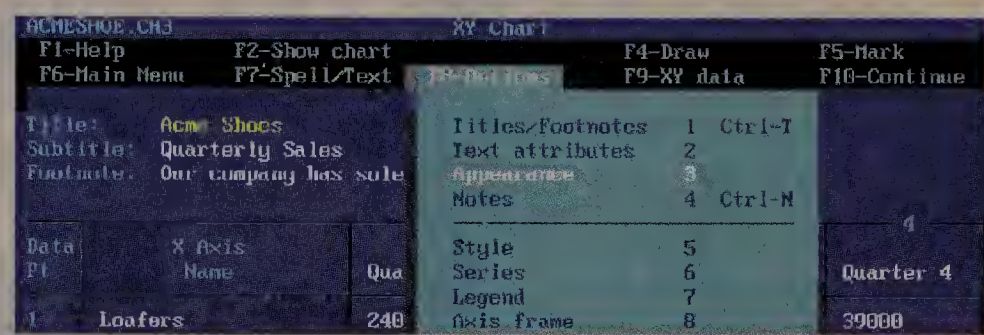



*From titles to footnotes. From colors to logos. Our global options keep it consistent.*

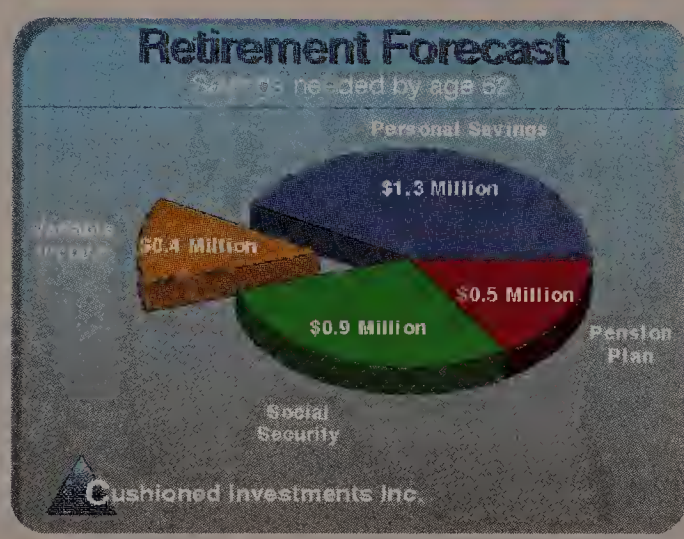



*…style it like you've never seen before.*



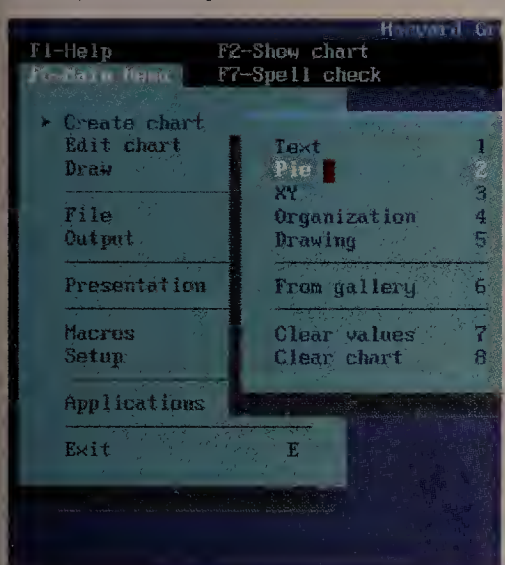

*Pull-down menus. A new feature to get at the features. Easier than ever.*

*Choose from 32 color palettes. Then shade. Mix. Blend.*

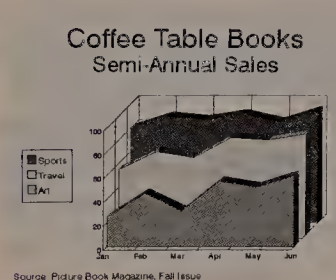



*You enter the data, we'll make it look good. It's what you've known us for all along.*

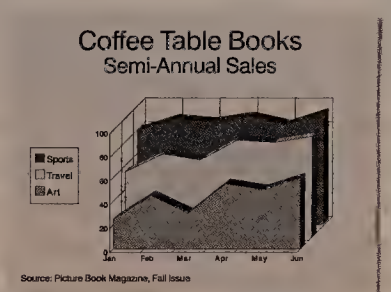
*How do 16 million colors sound?*




*Look familiar? It should. It's Harvard Graphics.*

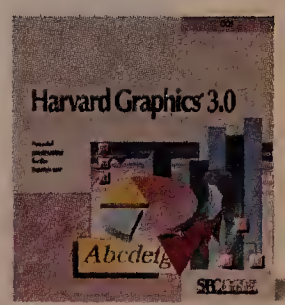



*What you see is what you get.*




*Yes, we have WYSIWYG.*

# Overwhelming evidence that Harvard Graphics® 3.0 is more than just another upgrade.

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SPC SOFTWARE PUBLISHING CORPORATION

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Power Launcher

## Open Applications as You Wish on Your Windows Desktop

Following quickly on the heels of Norton's *Desktop for Windows,* hDC's *Power Launcher* is yet another utility aimed at enhancing *Windows 3.0*'s menuing and program-launching capabilities. But the two packages take decidedly different approaches.

While the more expensive Norton program offers a grab bag of *Windows* extras, *Power Launcher* focuses on giving you control over when and how your *Windows* applications are loaded and run. The heart of *Power Launcher* is the Command Launcher, which is essentially an enhanced command line with a scrollable directory for selecting executable files. You also get pushbutton access to utilities for writing script files, recording keystrokes for macros, and setting windowing parameters such as window size and whether to load the program as an icon.

You'll find the program's menuing capabilities especially helpful if you have more applications than can be displayed conveniently with *Windows'* bundled icons. *Power Launcher* leads you through the construction of your own pulldown menus and submenus. The new menus, along with the program's utilities, are attached to a plus sign in the upper left corner of each *Windows* box and are accessible from any application.

Unlike *Desktop for Windows* or *Windows* itself, *Power Launcher* can launch batches of applications with a single command. You can, for example, create a menu item that will launch *Word for Windows, Excel,* and the *Windows* calculator, all sized and located just as you want them.

But *Power Launcher*'s most interesting feature is the Virtual Desktop, which lets you switch between as many as nine full-screen applications by clicking on one of nine small boxes in the corner of your screen. The only problem is, the boxes are blank. Although box size is relative to the size of the program, the lack of labels makes it all too easy to forget which box represents which application.

**Bringing order to your Windows desktop, Power Launcher gives you more control over how applications are loaded and run.**

Finally, an event scheduler helps automate certain types of tasks, essentially by writing a batch file that executes at a specified time. *Power Launcher* will carry a list price of $99.95 but will be offered at an introductory price of $79.95 through year-end.

—*Patrick Marshall*

**IN BRIEF**

**Power Launcher**
WINDOWS This utility enhances the Program Manager by giving you control over when and how your applications are loaded and run.
**hDC Computer Corp.**
6742 185th Ave. NE
Redmond, WA 98052
206/885-5550,
206/881-9770 (fax)
**Reader service no. 836**

LapLink Pro 4.0

## Linking the Extended Office

Business managers who spend more time out of the office than in need easy laptop-to-PC communications. For many that has long meant *LapLink*. Now *LapLink Pro* includes a *Windows*-like interface with pulldown menus, mouse support, new file management features, and transparent communications functions that make staying in touch with your deskbound data less of a chore.

No longer are you restricted by the reach of your cable—the $169.95 *LapLink Pro* provides full modem file transfer capabilities (an introductory price of $149.95 is available through year-end). And using the modem is relatively easy. The program automatically identifies and connects to the ports you and the recipient PC use. *LapLink Pro*'s remote install feature even supports modem connections with users who don't have a copy of the executable file: Just a few keystrokes by the recipient, and he or she can receive, install and use *LapLink Pro.*

*LapLink III*'s familiar split screen is retained, with the option of viewing tree displays of local and remote drives on the same screen at the same time. Want to go a little deeper? *LapLink Pro*'s simplified file management lets you retain tree mode and look at subdirectory structures by opening a window below the tree. Pulldown menus ease navigation and make command selections more intuitive, while context-sensitive help guides you through any sticky spots.

*LapLink Pro* speeds the transfer of data across phone lines with a compression algorithm that Traveling Software claims compacts text up to 30 percent and graphics up to 50 percent. Past versions allowed only one linked computer at a time to transfer files.

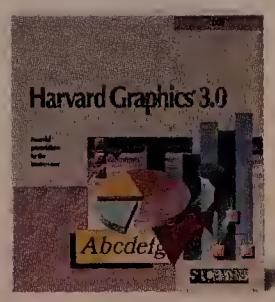
—*Russell Glitman*

**IN BRIEF**

**LapLink Pro 4.0**
This remote communication and file transfer software gains modem and mouse functionality at the same price as its predecessor.
**Traveling Software**
18702 N. Creek Pkwy.
Bothell, WA 98011
800/678-6620,
206/483-8088
**Reader service no. 837**

# More eye-popping visuals from Harvard Graphics.

As you can see, Harvard Graphics® 3.0, the hot new DOS upgrade from Software Publishing Corporation, is a winner in everybody's book. Take, for instance, *Software Digest*® and the National Software Testing Lab.®* In their highly regarded tests, Harvard Graphics 3.0 blew away not only all other DOS presentation programs, but the Windows™ programs as well. Call and we'll send you a summary of their report. It's a real eye-opener.




SPC SOFTWARE PUBLISHING CORPORATION

Call 1-800-336-8360, Operator 769, for a copy of the report and a demo disk.

*Software Digest Ratings Report, Volume 8, Number 8, July 1991. Software Digest is a registered trademark of NSTL Inc. Harvard Graphics is a registered trademark of Software Publishing Corporation. Microsoft Windows is a trademark of Microsoft Corporation. NSTL is a division of Datapro Information Services Group. ©1991 Software Publishing Corporation. All rights reserved.

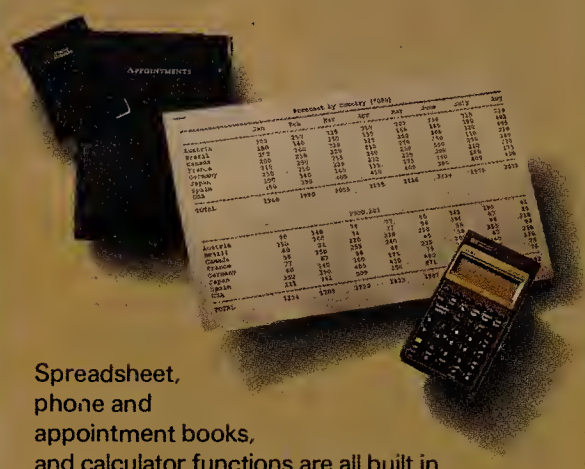
# With Lotus® 1-2-3® and more in the palm of your hand, HP gives you PC power to go

**At only 11 ounces, the new HP 95LX palmtop PC carries a lot of weight.**

It measures just 6.3" x 3.4" x 1" (closed). And costs only $699. Yet our new HP 95LX puts real PC power in your hand.

The Lotus 1-2-3 Release 2.2 is the real thing, since we created our palmtop PC in collaboration with Lotus Development Corporation. So it's easy to take your spreadsheets with you. Do "what ifs." Edit files. Attend meetings with all the latest figures in hand.

The optional Connectivity Pack makes our PC an extension of yours.



Spreadsheet, phone and appointment books, and calculator functions are all built in.

But the HP 95LX offers much more than spreadsheets. You can edit memos, and exchange them with your desktop PC's word processor. Built-in organizer tools give you access to phone numbers and addresses. Let you schedule appointments and tasks. And set alarms.

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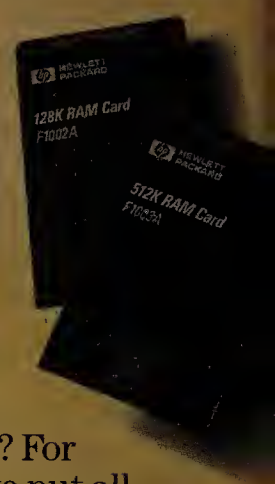


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Paul Somerson
*PC Computing*
July 1991
MS-DOS 5 Review

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Paradox SE, Quattro Pro SE

## Borland's Special Edition Bargains

Borland, the company that was built on good but inexpensive software, is at it again. Now you can get stripped-down versions of its best-selling *Paradox* and *Quattro Pro* for under $100 each. Both programs lack network support so appear bound for home and laptops.

Despite its $69.95 price, *Quattro Pro SE* (for *Special Edition*) is still a very powerful spreadsheet program, with the full set of functions, data base tools, and hot-link capabilities that are found in the full-priced *Quattro Pro 3.0*. You can still move around your worksheets—and move your worksheets via your keyboard or mouse, creating simple or complex templates for handling and graphing your math and data.

But you probably won't need powerful presentation tools at home or for laptop analyses, and that's where Borland did most of its cutting. Gone is *Quattro Pro 3.0*'s interactive WYSIWYG display mode; if you want to see what a range looks like on paper, you must use the print-preview feature.

Also missing is the print-to-fit feature, which scales a range to fit on a single page before printing it. And *Quattro Pro SE* gets by with seven rather than nine scalable font outlines. You'll also have to learn *Quattro Pro*. In what may be a simple piece of cost cutting, but might also be a decision inspired by attorneys, *Quattro Pro* does not sport the full product's optional *1-2-3*–compatible menus and the ability to hot-key into *Paradox*.

Intended for the nonprogrammer, the $99.95 *Paradox SE* contains many of the tools that helped make the *Paradox* data manager a recent *PC World* Best Buy, including the easy-to-use form and report designers and the famous query-by-example tool. With these features, you can easily set up a data base—relational or otherwise—enter data, pull out the information you're looking for, and print a clear, good-looking report.

But if you need to set up a data application for your work group, *Paradox SE* won't do at all. It runs applications written in the *Paradox* PAL language beyond recording simple macros, but you won't be able to make any, since the SE version doesn't support programming. Also missing are the tools that help nonprogrammers develop their own applications: These included the Personal Programmer code generator, the sample applications, and the Data Entry Toolkit library of PAL routines. And *Paradox SE* is strictly a one-person tool, with no provisions for managing data on a network.

Both *SE* programs come with revamped documentation that is intended for novice users who aren't familiar with spreadsheet or data base concepts.

—*Lincoln Spector*

### IN BRIEF

**Quattro Pro SE, Paradox SE**
These reasonably complete, very reasonably priced versions have everything a home or laptop user might need but lack presentation and work group tools.
**Borland Int'l**
1800 Green Hills Rd.
Scotts Valley, CA 95066
800/331-0877
**Reader service no. 827**

Lexmark PPS II 2380, PPS II 2390

## A Straight Path for the Paper Chase

If you need a printer for multipart forms and wide spreadsheets, IBM spin-off Lexmark offers a pair of reasonably priced dot matrixes. The 9-pin PPS II 2380 and the 24-pin PPS II 2390 sell for $499 each in standard-carriage configurations and $699 in wide-carriage. You'll find the 9-pin a bit faster, but the 24-pin offers more fonts and better letter quality and graphics printing.

Both printers feature a straight paper path, which reduces the chances of jamming or being off-register with forms. Both give you a variety of paper-handling choices, including a switchable push/pull tractor that can feed from the front, back, or bottom. With the push tractor, fanfold sheets tear off easily. To help with fanfold paper and perforated forms, paper feeds to the tear-off position. When the next job arrives, the first page is set to its first print position.

The 2380 and the 2390 include most other standard features. The 2380 offers 144-by-240-dpi graphics, while the 2390 can print the same files at 360-by-360-dpi. However, these resolutions can be reached only by using the maximum amount of buffer space. The 11K buffer on the 2380 and the 32K buffer on the 2390 can be expanded by 32K each, but that still doesn't leave much room for a big graphics job.

The 2380 prints at about 279 characters per second in draft mode, the 2390 at about 180 cps. The 2390 offers you eight fonts—Presenter, Orator, Script, Prestige, Courier, Gothic, Draft, and FastDraft. The 2380 provides only the latter four.

Both printers boast an impressive 7000-hour mean time between failures, about 2000 hours higher than most of its competitors.

The printers ship with emulations for IBM Proprinters X24 and XL24 and Epsons LQ-850 and LQ-1050. You must contact your dealer for additional drivers or download them from the Lexmark bulletin board. Other options include a legal-sized paper tray and a stand to fit these 19.6-by-11.3-by-7.5-inch printers.

—*Susan Lusty*

**IN BRIEF**

**Lexmark PPS II 2380, PPS II 2390**
The first products from IBM's spin-off, Lexmark, are durable, reasonably priced 9- and 24-pin dot matrix printers.
**Lexmark Int'l, Inc.**
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800/537-2540
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Stuart J. Johnston
*InfoWorld*
July 29, 1991

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Harvard Draw for Windows 1.0

## Quick on the Draw

Presentation graphics programs are great for making snappy-looking charts and graphs, but their drawing tools are usually one step beyond Etch A Sketch. If you need to create a complex image such as a company logo, you need a sophisticated illustration package like *Corel Draw, Micrografx Designer*—or *Harvard Draw for Windows.*

*HDW*'s main drawing card is speed. Software Publishing Corporation (makers of the leading presentation package, *Harvard Graphics*) claims its $595 program is many times faster than the competition at redrawing complex images.

*Draw*'s fast display skills mean you can do more work in preview mode (instead of bare-bones outline mode) and view colors, line widths, and fonts as you draw.

Users of *Corel Draw* or *Designer* should feel right at home with *Harvard*'s icon-based interface. *HDW* comes with all the image-creation tools you'd expect in a high-end illustration package, including Bézier curves and the ability to rotate text or align it along virtually any path.

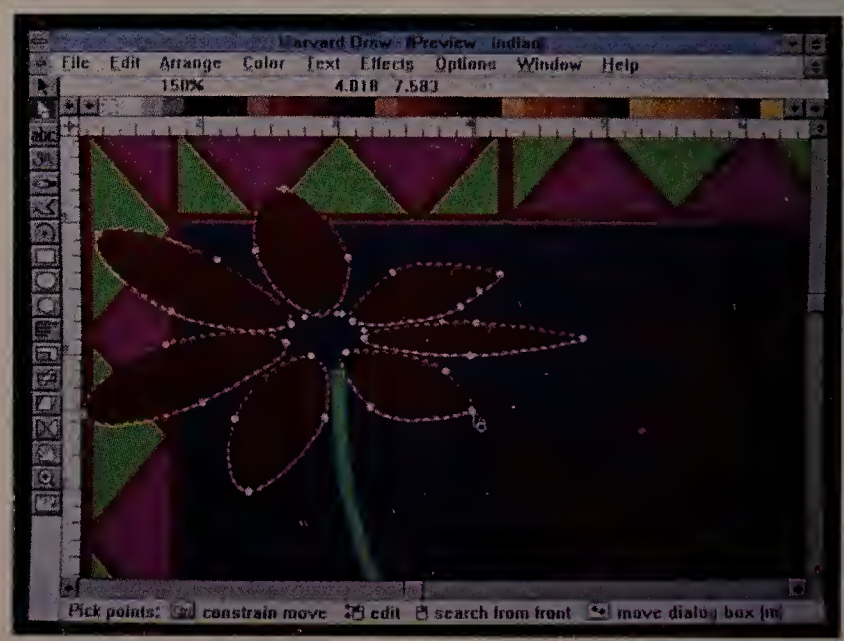
A built-in auto-trace module lets you convert scanned images to vector drawings, and 16 levels of undo/redo give you wide latitude for changing your mind. You can display six editable views of each image, and thus see the entire image in one window while zooming in for detail work in several others.

For the less artistically inclined, *Harvard Draw* provides more than 1600 clip-art images. You can also add text to drawings, choosing from 47 scalable Bitstream typefaces.

But you'll need to clear a wide swath on your hard disk. Installing the program files and fonts requires 10MB; adding clip art and other options brings required disk space to 28MB. —*Daniel Tynan*

**IN BRIEF**

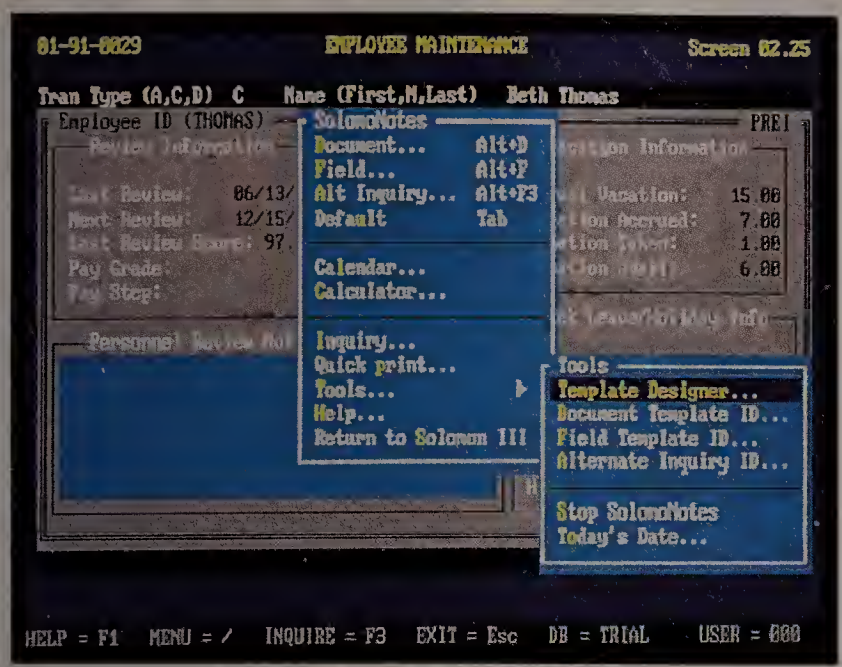
**Harvard Draw for Windows 1.0**
WINDOWS *Harvard Draw combines speedy performance with sophisticated illustration tools.*
**Software Publishing Corp.**
3165 Kifer Rd.
Santa Clara, CA 95051
408/986-8000
**Reader service no. 829**




**Harvard Draw for Windows is so fast at drawing even complex images that you can do more work in preview mode instead of outline mode.**

SolomoNotes

## Adding Customized Client Information




**Now you can attach data templates to any Solomon III data entry field, giving you 99 user-defined data fields with which to track information.**

An add-on to the *Solomon III* high-end accounting package lets you track client-specific and vertical market data. With *SolomoNotes*, a relational information manager, you can attach to any *Solomon III* data entry field your own note that can hold any type of client information.

*SolomoNotes* data fields are displayed in pop-up windows called *data templates*. Templates are predefined for more than 500 *Solomon III* entry fields, and another 2000 *Solomon III* fields accept templates you define. Each template holds up to 99 user-defined data fields, enabling you to set up and track virtually any type of information.

For example, you can add a profile note to an employee ID file and then delete, move, or edit those note fields within the *SolomoNotes* templates. In addition to user-defined fields, *SolomoNotes* provides a 60K Comments field on every data template.

Once you create a new field in a *SolomoNotes* data template, its information is automatically available to *Solomon III*'s Report & Graph Designer module, in which you can design custom reports that include both *SolomoNotes* and *Solomon III* accounting information.

*SolomoNotes*, which comes with a built-in calculator, runs as a memory-resident program. Optimal performance calls for a minimum 2MB of RAM, although only 640K is required. *SolomoNotes* also requires DOS 3.3 or higher and an 80286 or higher processor. Data is stored in DBF file format for access by *dBASE* and other data base programs. The price is $795.

—*Christine Whyte*

### IN BRIEF

**SolomoNotes**
This relational-information-manager add-in to *Solomon III* lets you track client-specific and vertical market data in pop-up data templates.

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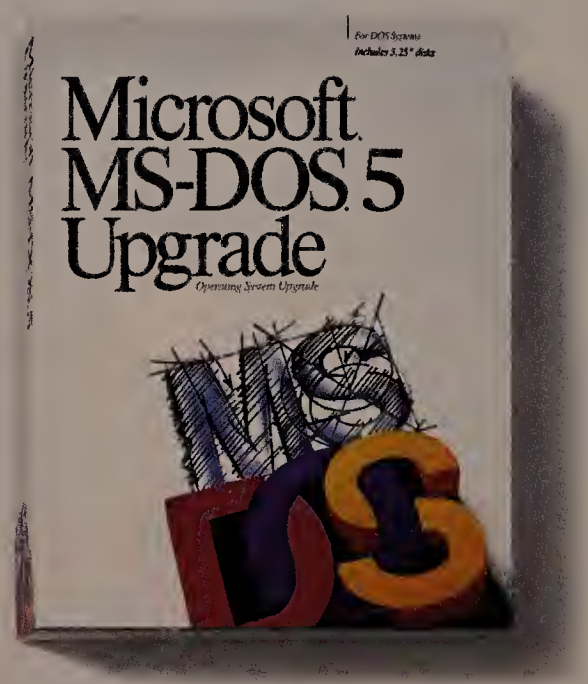


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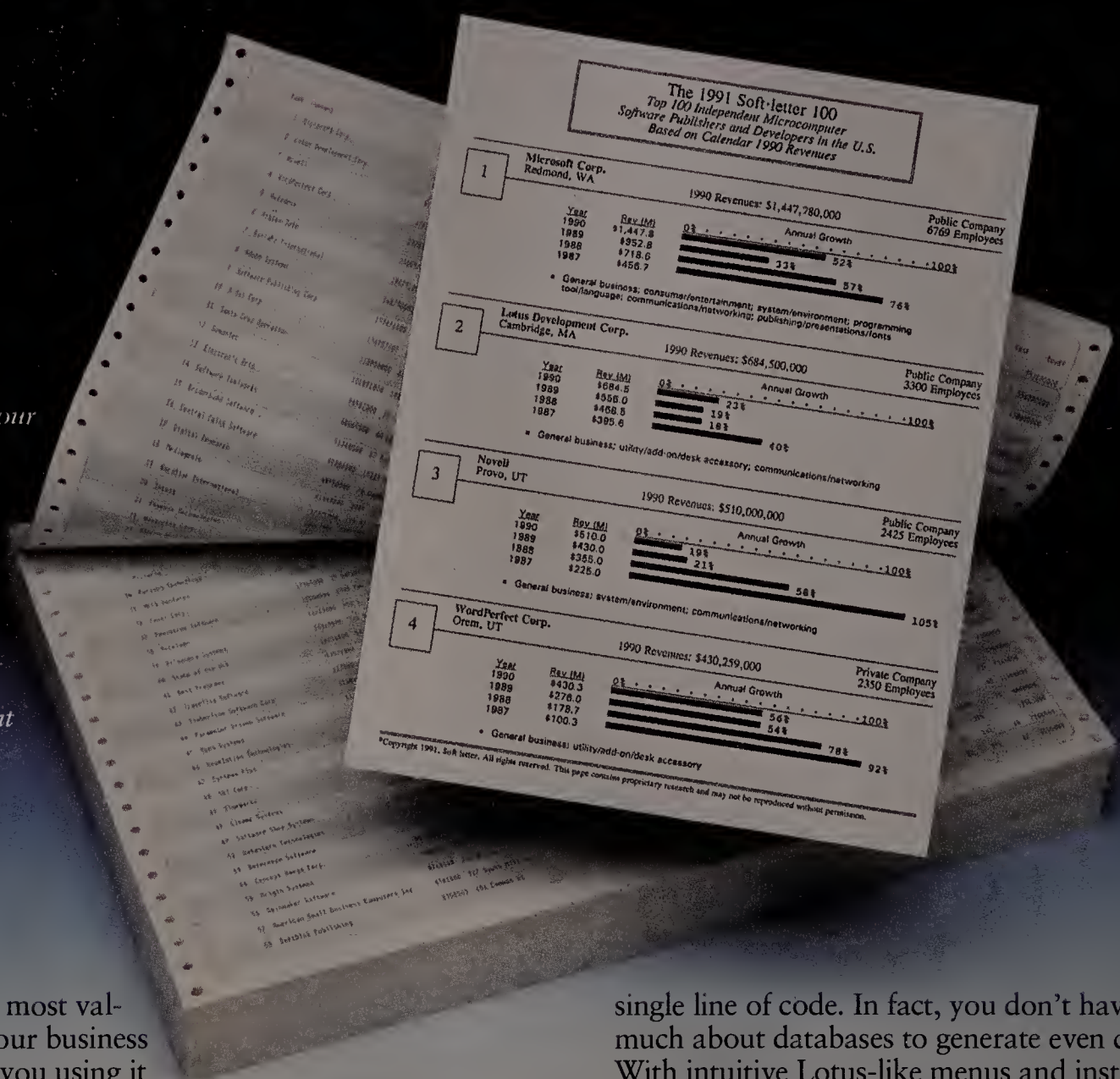


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**Circle 181 on reader service card**

# UPDATE

## New Versions of Your Favorite Products

### IIP Plus

**The IIP Plus improves on the IIP with a 16-MHz processor, faster parallel port, a 70-sheet standard tray, and quicker start-ups.**

Hewlett-Packard is replacing its popular IIP personal printer with the IIP Plus. Essentially a PCL 4–equipped version of the newer PCL 5–equipped IIIP, the IIP Plus also has less standard memory—512K versus 1MB. Improvements include a 16-MHz processor on the controller instead of 10-MHz, a parallel port that HP claims is four times faster (but no serial port at all), a 70-sheet standard tray instead of a 50-sheet, and the ability to accept data and start processing a print job while the print engine is warming up. Last but not least, the IIP Plus lists for $1249, about $46 cheaper than the IIP's price. Hewlett-Packard Inquiries, 19310 Pruneridge Ave., Cupertino, CA 95014; 800/752-0900.

**Reader service no. 840**

### Persuasion 2.0

Aldus's *Persuasion 2.0* now costs $99 if you trade up from *Harvard Graphics*, *Lotus Freelance*, *PowerPoint*, *Applause II*, *Hollywood*, or other eligible desktop presentation packages. To get the $495 *Persuasion 2.0* for this low price, see your reseller or contact the Aldus Fulfillment Center at 800/638-7058. Aldus Corp., 411 First Ave. S, Seattle, WA 98104-2871; 206/628-2320.

**Reader service no. 842**

### Super PC-Kwik 4.1, PC-Kwik Power Pak 2.1

*Super PC-Kwik 4.1* can speed your application by writing data to disk faster than ever before. As data stacks up in *PC-Kwik*'s cache, the new PowerWrite algorithm writes it to disk in the most efficient possible order. The PowerWrite feature is available in both the $79.95 *Super PC-Kwik 4.1* and the $129.95 *PC-Kwik Power Pak 2.1*, which includes a memory manager, a print spooler, and other utilities with the cache. Upgrades are $19.95 for *PC-Kwik* users, $29.95 for *PC-Kwik Power Pak* users, and $39.95 for *PC-Kwik* users upgrading to the *Power Pak*. Multisoft, 15100 S.W. Koll Pkwy., Ste. L, Beaverton, OR 97006; 800/274-5945, 503/646-8267 (fax).

**Reader service no. 841**

### OmniPage Professional 2.0, ReadRight

WINDOWS Caere's *OmniPage Professional* and OCR Systems' *ReadRight* have been upgraded for improved scanning accuracy, the former under DOS and the latter under *Windows 3.0*. At $995, *OmniPage Professional 2.0* reads text at an accuracy rate of about 99.9 percent. It is also the first to support Hewlett-Packard's *Accupage* scanner utility and includes a WYSIWYG text editor to help you at print time. The $495 *ReadRight* also claims 99.9 percent accuracy. Its updates are free, those for *OmniPage Professional 2.0* cost $100 from 1.0, or $150 for 386 owners. Caere Corp., 100 Cooper Ct., Los Gatos, CA 95030; 800/535-7226, 408/395-7000.

**Reader service no. 843**

OCR Systems, Inc., 1800 Byberry Rd. #1405, Huntingdon Valley, PA 19006; 800/233-4627, 215/938-7460.

**Reader service no. 844**

### Stacker 2.0

Stac Electronics has upgraded its data compression software and coprocessor boards designed for 16-bit AT bus or Micro Channel PCs.

The company claims that version 2.0 of the *Stacker* automatic compression/decompression software is as much as 25 percent faster than past versions, while the boards speed compression/decompression by up to 30 percent. Either can more than double the storage available on your hard disk. *Stacker 2.0* sells for $149. The 8-bit board, 16-bit AT board, and MCA board sell for $199, $249, and $299, respectively. Software upgrades are $49. Stac Electronics, 5993 Avenida Encinas, Carlsbad, CA 92008; 800/522-7822, 619/431-7474.

**Reader service no. 845**

### Takeover, Takeover Lite

The *Takeover* remote control/communications package has gained both speed and interface enhancements. The $295 *Takeover 2.0* features remote mouse support, faster screen refresh, and other graphics and performance enhancements. The $179 *Takeover Lite* includes all the remote-control capabilities of the full package as well as basic data communication features—but it lacks the bundled *Mirror III* communications package. *Lite*'s host and guest modules sell for $99 each. Upgrades to *Takeover 2.0* are $75. SoftKlone Distributing Corp., 327 Office Plaza Dr. #100, Tallahassee, FL 32301; 800/634-8670, 904/877-9763 (fax).

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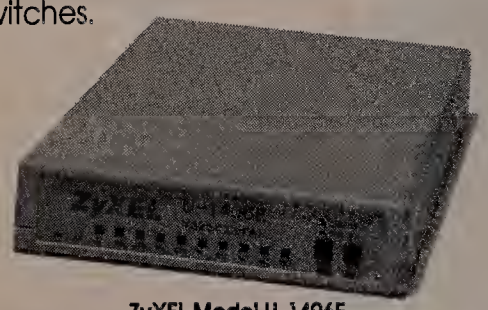

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| V.22bis/V.22/BELL 212A at 2.4, 1.2 Kbps | ● | ● | ● |
| V.21/BELL 103 at 300 bps | ▲ | ▲ | ▲ |
| V.33 at 14.4, 12.0 Kbps | ● | | |
| V.29 at 9.6, 7.2, 4.8 Kbps | ● | | |
| V.27ter at 4.8, 2.4 Kbps | ● | | |
| G3 FAX | ● | ● | ● |
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| Dynamic Online Fall back/forward | ● | ● | ● |
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| V.42bis/V.42; MNP5/MNP4 | ● | ● | ● |
| Max. Throughput Possible(K); DTE | 76.8 | 57.6 | 57.6 |
| 2-Wire Dial Up and Leased Line | ● | ● | ● |
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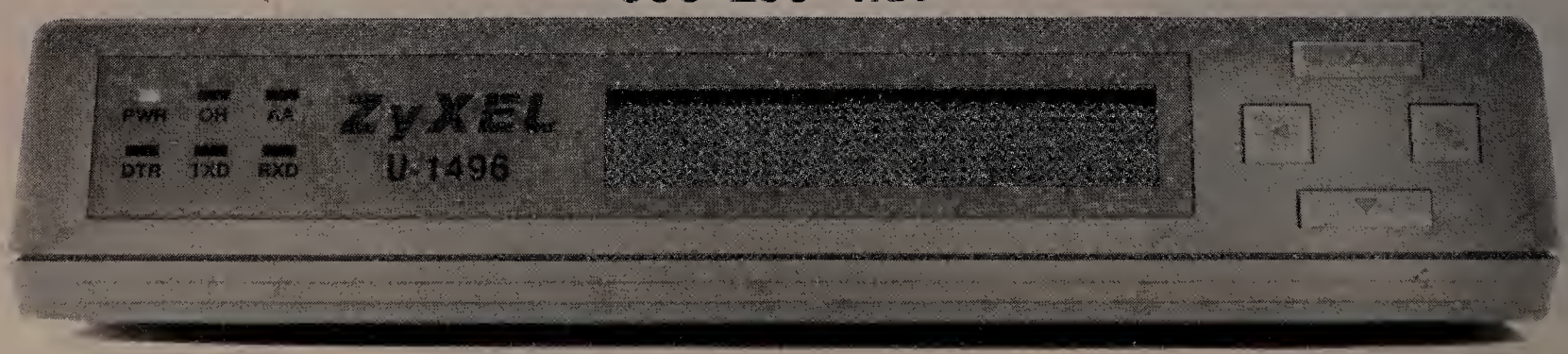


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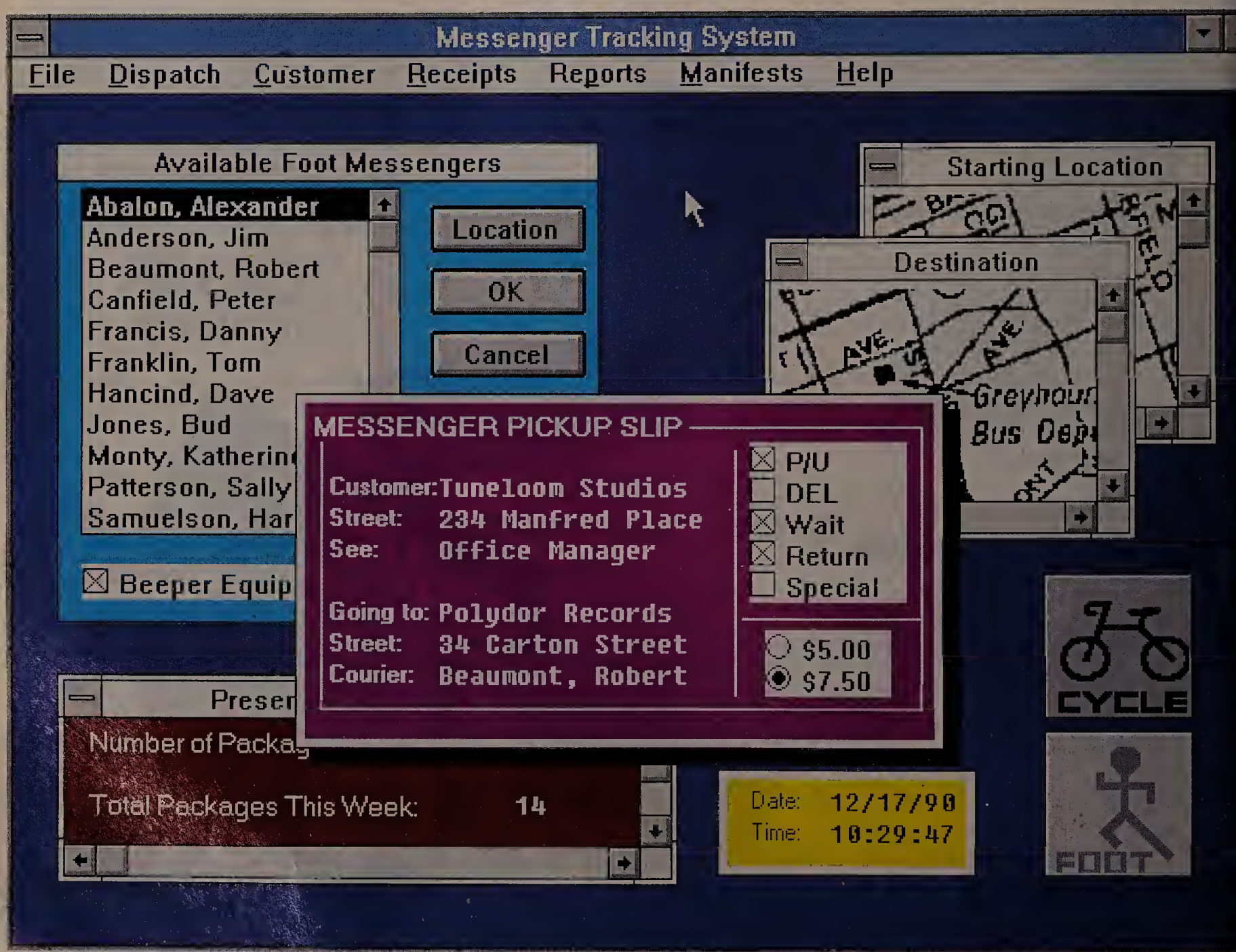


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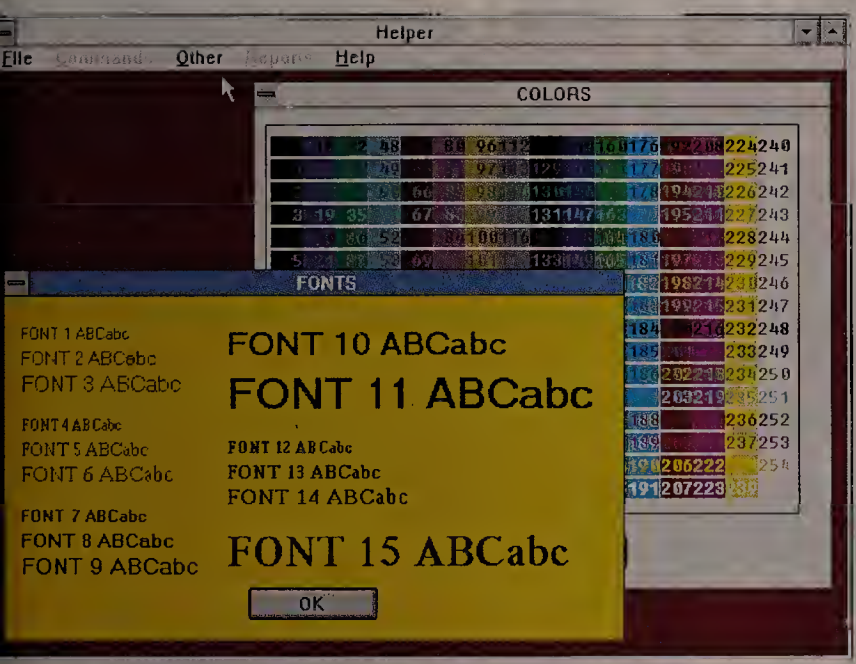


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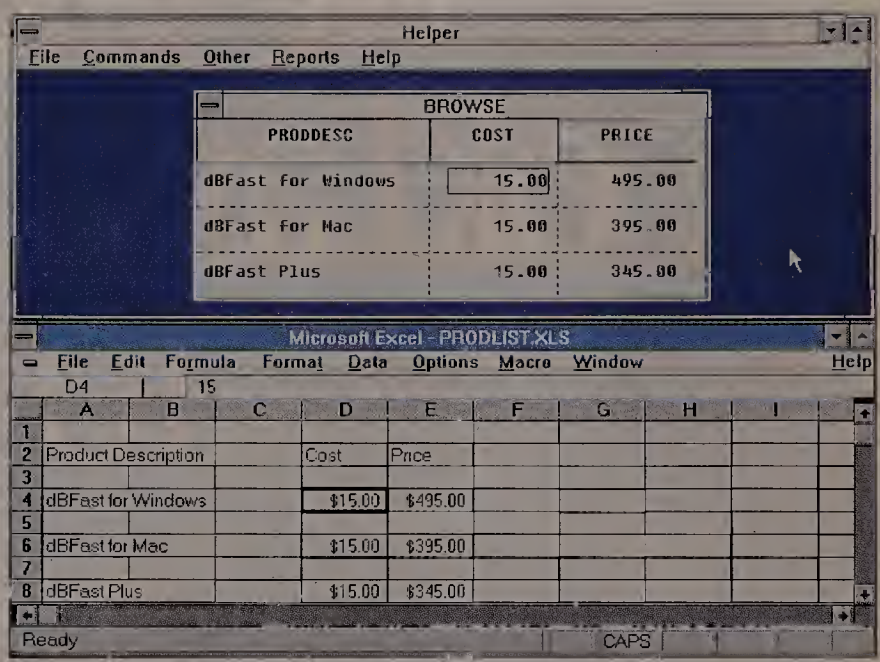


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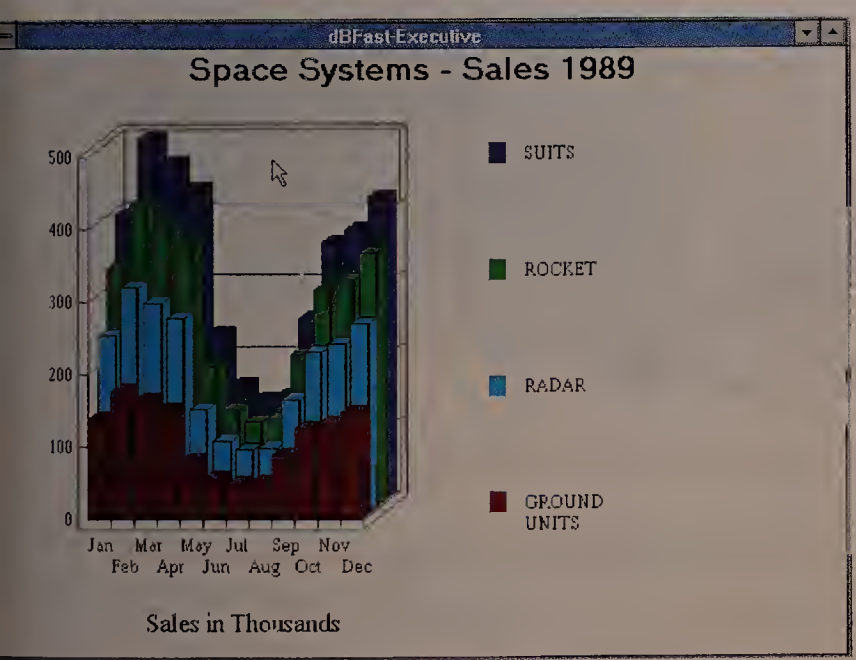


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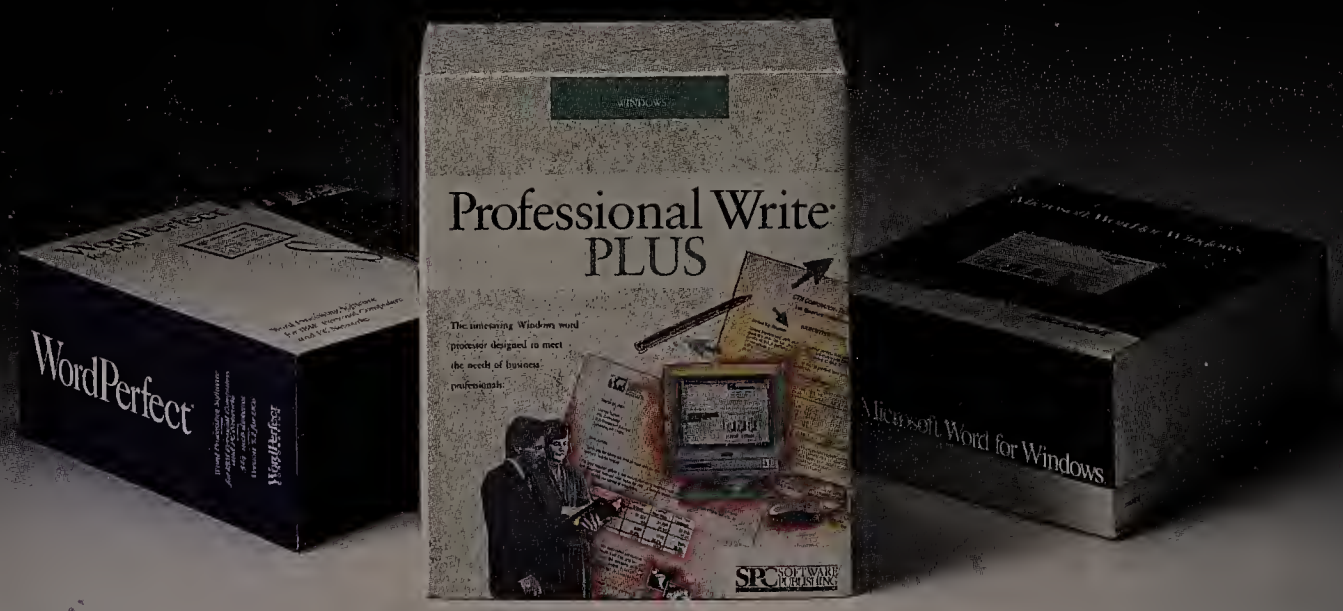
# In this year's word processing shootout, we laid some old assumptions to rest.

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COVER STORY

SPECIAL HARDWARE ISSUE

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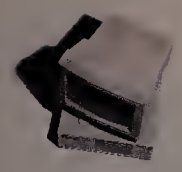

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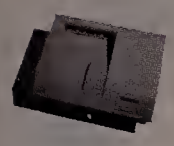

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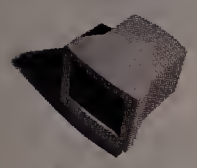

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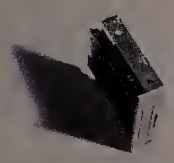

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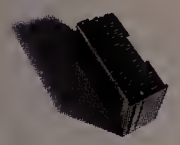

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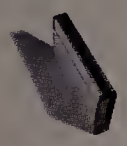

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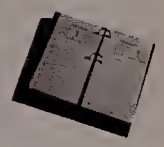

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## A Complete Guide to Today's Hottest Hardware

It's all here—all the hardware you need to keep your office humming. You'll find affordable 486SX systems that spin *Windows* like a top, and high-speed modems that save you a bundle downloading files. Get the scoop on hard disks as big as 125MB and capacious QIC-80 tape backups that keep you from having to reinvent your business when your hard disk fails. Want to whip up stunning documents? Avoid font mishaps with the fast, low-cost PostScript printers reviewed here. Finally, a dozen new big-screen monitors offer a better view of *Windows* than ever before, at painless prices. If you're not ready to buy, Amy Wohl's exciting predictions for the coming year's products and "Budgetopoly," a game that leads you through the steps involved in purchasing hardware, will give you further reason to procrastinate. Happy budgeting!

# 486SXs

**With the latest Intel engines, these 11 hot performers take the sting out of 486 prices. Are they the new business workstations of choice?**

Never before have computer buyers faced so many choices, and never have there been so many great machines at great prices. The appearance of Intel's new 486SX chip (and AMD's 386/40) make the game more exciting, but you have to know what you're doing to make the right deals. Currently there are 14 different 32-bit platforms based on chips ranging from the 16-MHz 386SX to the 50-MHz 486DX. All are capable of running the next generation of 32-bit applications—at vastly different speeds and prices.

As long as you stay in the world of Intel processors, the odds are easy to figure: The faster the chip, the higher the price. Machines based on Intel's 486SX outperform 33-MHz 386DX systems—slightly—and generally sell for $100 to $500 more. However, AMD's introduction of the 40-MHz 386DX has dropped a wild card into the game. A speedy 386/40 system, which outperforms both the 386/33 *and* the 486SX, can be had for less than either if you're willing to buy from a smaller vendor. (For more price/performance comparisons of platforms, see "33-Something: Still Hot After All These Years.")

In any case, if you want that last tweak of speed without jumping to an expensive 486DX, and you prefer to buy an Intel CPU from an established company, the 486SX chip is very good news—especially if you're willing to shop carefully. Like its older sibling, the 486DX, the SX delivers the fastest possible performance. The speed comes from its ability to execute frequently used instructions in a single clock cycle and its built-in 8K memory cache (see "Inside the 486SX"). In fact, most users will find that their new 486SXs run programs such as *Windows* so fast that trips to the coffee machine while the PC switches from *Word* to *Excel* are no longer necessary. These systems are even fast enough to make ideal servers for a small network.

The only bad news is that the 486SX lacks a working math coprocessor. Of course if you use a word processor or a data base or plan to have your 486SX run a network operating system, you don't need one. Even spreadsheets won't benefit from a coprocessor unless called upon to do financial and statistical calculations. However, if you rotate fonts with a program such as *Arts & Letters* or use a PostScript interpreter such as *Go Script*, you'll probably want a math chip—and if you use CAD/CAM applications you'll *need* one. That could mean a top-of-the-line 486DX system or, if you're on a tight budget, a fast 386DX with a math chip installed. You can add a math coprocessor to most 486SX systems, but it will cost you $600. A full-fledged 486DX/25 costs only a couple of hundred more, and you can probably get a 386 (33 MHz or 40 MHz) with a coprocessor for a lot less.

If you're not sure whether the 486SX chip will be powerful enough, seven of the machines in this roundup enable you to upgrade to a faster CPU by swapping out a daughterboard or plugging in a new chip on the mother board. Some of these machines include a CPU upgrade socket that should support "double-speed" chips that Intel will release sometime in the first half of 1992. This means that you don't need to invest a bundle now in order to protect your options later.

SETH NOVOGRODSKY

PHOTOGRAPHS BY ROBERT CARDIN, SET BY BUD PEEN

AST

**Take Your Best Shot**

Our tests of 20-MHz 486SX systems show no significant differences in performance on spreadsheets but large differences on data bases and other applications that frequently read from or write to the disk drive. How come? Look to the disk drives and controllers, which can increase price as well as performance. Of course if your applications include a lot of disk-intensive programs like a data base, it will be worth it. The ALR BusinessVEISA, with its high-performance caching ESDI disk controller, finishes the *dBASE* sort test in 6:55 and costs $5600. The Tangent 420S takes about 2½ minutes longer and costs $2539, leaving you $3000 to spend on a faster disk system, a second 486SX PC, or a Concorde flight to Paris—whichever you prefer.

For sheer speed, the ALR BusinessVEISA takes the gold. If saving money is your top priority, the Tri-Star Flash Cache is the lowball winner at a price even a miser could love. In the market for a server? The Everex Step 486SX/20 combines a tower case with above-average performance, outstanding expandability, and fine support. But for the best balance of price, performance, expandability, and service we have no hesitation about recommending our Best Buy, AST's Premium II 486SX/20. Chances are, one of the machines in this roundup will meet your needs. If not, don't worry—many more are on the way.

*Seth Novogrodsky is editor of the* Berkeley Computing Bulletin. *Michael Goodwin is an associate editor for* PC World, *and Karl Koessel is the technical editor.*

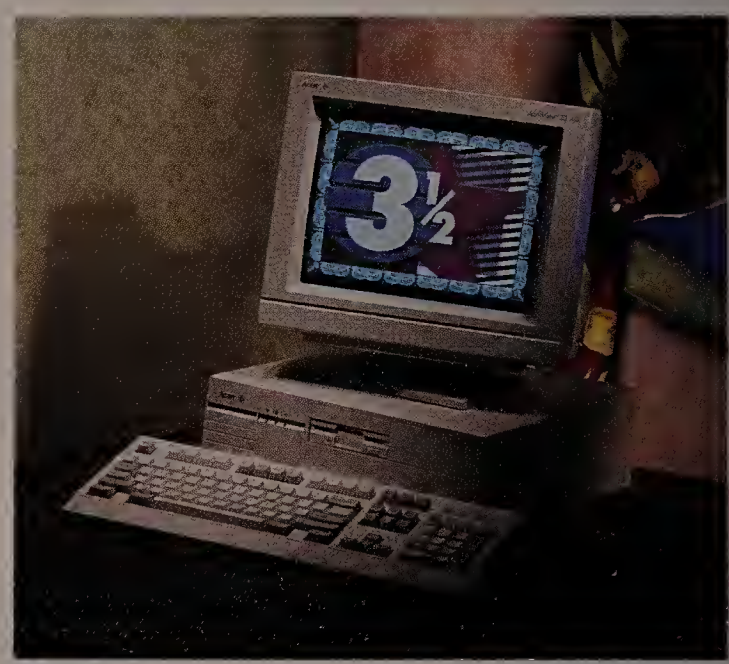
**For more information about all products in this article, circle reader service no. 907.**

## AcerPower 486SX

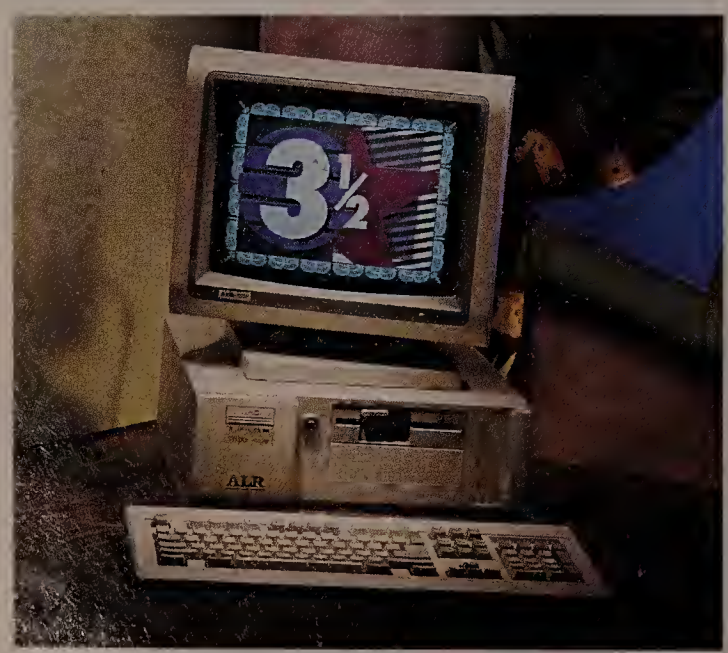
**PROS:** Fast, huge RAM capacity, two-year warranty, Windows included
**CONS:** No central support

It's not easy to find high speed and reasonable price in one machine, but that's what the $3464 AcerPower delivers. This speedster took second place in our benchmarks, and you can add a humongous 98MB of fast RAM. Also, if you outgrow the 486SX chip you can simply plug in a 25- or 33-MHz 486DX.

Ease of use is tops on this ISA machine, with its small footprint, front-mounted switches, and responsive keyboard. Better yet, it comes with a two-year warranty. However, Acer doesn't offer central support, and it doesn't require its dealers to maintain a dedicated support staff. Another drawback is that you can install only one 5¼-inch drive—and if you do, it will fill up two bays. Still, if high speed, reasonable price, and a free copy of *Windows* sound good to you, you'll agree that the AcerPower 486SX is one of the most appealing systems around.




**The AcerPower 486SX flies like a racehorse and gives you an easy ride with its front-panel reset and snappy keyboard.**




**If the ALR BusinessVEISA 486ASX's $5600 price doesn't scare you, its velocity might—this is the fastest 486SX we tested.**

## ALR BusinessVEISA 486ASX

**PROS:** Fastest in roundup, EISA bus, fine service and support
**CONS:** Expensive

If you live for speed, ALR has your number. This EISA system took top performance honors on both disk-intensive *and* CPU-intensive applications, but there's a catch. The system gains much of its performance edge from a high-speed (and high-priced) caching ESDI disk controller, which brings the estimated street price to $5600—one of the highest in the roundup. What's more, not many dealers were carrying this specially configured system as we went to press.

The BusinessVEISA's CPU is mounted on a daughterboard that you can swap out to install a faster CPU. And if you need help making that swap (or for any other reason), you'll be happy with ALR's reliable service and support. So if you need the fastest system on the block, and don't mind paying extra for it, the BusinessVEISA could be your dream come true.

# Buying Smart

Buying a fast new machine that loads your applications in half the time is always a thrill, but the excitement wears off. At that point you'll be glad you paid attention to the mundane features that make the difference between agony and ecstasy: switches that are easy to reach, a keyboard that suits your typing style, a system that runs all your software without application errors, plenty of slots, and a friendly voice at the other end of the tech support line no matter when you call.

**PERFORMANCE**

Hot performance is a given with these 486SX machines, but they still differ significantly. If you use a data base program such as *dBASE*, you'll benefit from a speedy hard drive and controller. Likewise, if you're doing desktop publishing or graphics-intensive CAD/CAM work, think about buying a fast video card with an onboard graphics coprocessor. Our top gun overall was ALR's premium-priced BusinessVEISA—due primarily to its caching ESDI disk controller.

**PRICE**

We base our cost comparisons on *street price*, and to make sure everyone is competing on a level playing field, we price every system in the same standard configuration: 4MB RAM, a 100MB to 200MB hard disk, color VGA monitor, single floppy, mouse, and DOS. (A few exceptions are noted in text.) For every machine (except those sold directly), our research staff calls at least three PC dealers in six major cities across the country and gets multiple price quotes. Results for each system are then averaged. The champ of cheap: Tri-Star's $2257 Flash Cache 486/20sx.

**EXPANDABILITY**

If you want to hook your computer to a network as a workstation, you should be able to access the file server. That means you can probably get by with one internal and two externally accessible bays, which gives you room for a hard drive, a floppy drive, and a tape backup or CD ROM. For a stand-alone PC or a file server, you'll probably want at least one more bay for an additional hard drive.

Four free expansion slots are probably plenty for most users, but five are better. The ISA-based Everex Step 486SX/20 boasts the best slot-and-drive capacity here.

All these 486SX machines allow you to add a 487SX math coprocessor for around $600, and most allow you to upgrade the CPU simply by plugging in a faster chip or swapping out a daughterboard. Most should also support Intel's "double-speed" chips due in the first half of 1992, which boost system performance by running internally at twice the system's speed. Given the pace of technological advances, an upgradable CPU is cheap insurance against obsolescence.

**SERVICE AND SUPPORT**

At a minimum, all machines should come with a one-year warranty and a telephone support line. Some manufacturers go well beyond that.

We test technical support by calling central support numbers, asking three questions of varying difficulty, and rating the responses on promptness, courtesy, and accuracy. Then we factor in any support extras like free on-site service, toll-free phone support, fax lines, and so on. We rate dealer support by looking at the vendor's policies on dealer training, inventory, and support staff. American Mitac and Tri-Star tie for top service and support.

**FAST RAM**

Multitasking with *Windows* and OS/2 demands large amounts of RAM, and fast RAM (which runs at the same speed as the CPU) gives you the best performance. All these 486SX machines can accommodate at least 32MB of fast RAM, and since only UNIX or NetWare 386 and a large network currently take advantage of anything over 16MB, they all win four-star ratings. But if you really want to plan for the future, the greater the capacity for RAM expansion, the better. The Reply's 128MB ceiling is high enough to make airline pilots nervous.

**DESIGN AND CONSTRUCTION**

Ease of use is subjective, but there are some universal dos and don'ts. Be sure the keyboard is comfortable and the monitor easy on your eyes. If noise is a problem for you, listen before you buy. The power switch, reset button, and floppy drives should all be easily accessible. Getting under the hood shouldn't take a box full of tools. To make sure your system will work with the usual software and peripherals, we run these systems through tough compatibility tests. Dell's PowerLine 420DE took top design honors and Reply's Model 32 486SX/20 won a close second.

## AST Premium II 486SX/20

**PROS:** Fast, easy-open case, strong service and support
**CONS:** Clickless keyboard

The $3841 AST Premium II gives you everything a demanding user needs and doesn't cost an arm and a leg. Fleet and reasonably priced, it boasts a small footprint, thoughtful ergonomics, plenty of bays and slots, and a 210MB drive. For easy upgrades, the Premium II mounts its CPU on a daughterboard, which plugs into one of three special 32-bit slots.

When the time comes to go under the hood, you won't have to use a screwdriver to open the Premium II's case. And should you need the manual, you'll find it well organized and peppered with diagrams. The Premium II also provides a fine support package, including a toll-free tech support line and optional on-site service. In fact, aside from a more responsive keyboard, it's hard to think of any way to improve this impressive Best Buy.

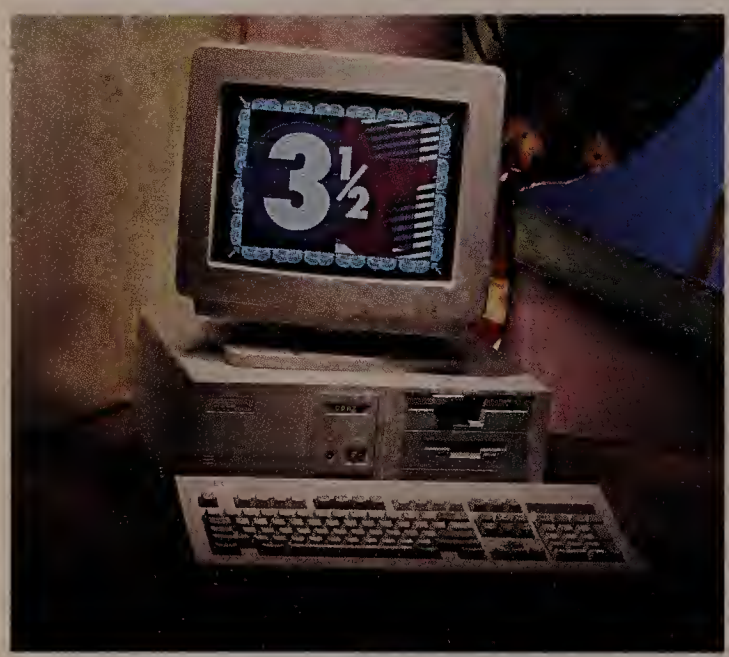
**Balance is everything when buying a system. AST's Premium II is neither the fastest nor the cheapest, but it is the Best Buy.**

## Dell PowerLine 420DE

**PROS:** Fast, EISA bus, easy-open case, superb service policies
**CONS:** Problematic phone support

Dell's EISA-based PowerLine 420DE is impressively fast—placing second in both *dBASE* and *1-2-3* tests—and comes with a generous assortment of slots and bays and an upgradable CPU. Its outstanding ergonomics include a "SmartVu" LED diagnostic display that could save you a lot of pain if something goes wrong.

Dell has a reputation for excellent service and support. It gives you a year of on-site service, seven-day-a-week phone support, and a four-day repair turnaround. This time, though, when we made our test calls we found a disturbing slump in Dell's usually excellent support quality: Once we were put on hold for 10 minutes; twice we had to leave a message; and once it took a technician 18 business hours to call us back. In any case, the PowerLine 420DE's speed, expansion capacity, EISA bus, and ease of use make it one of the best deals here.



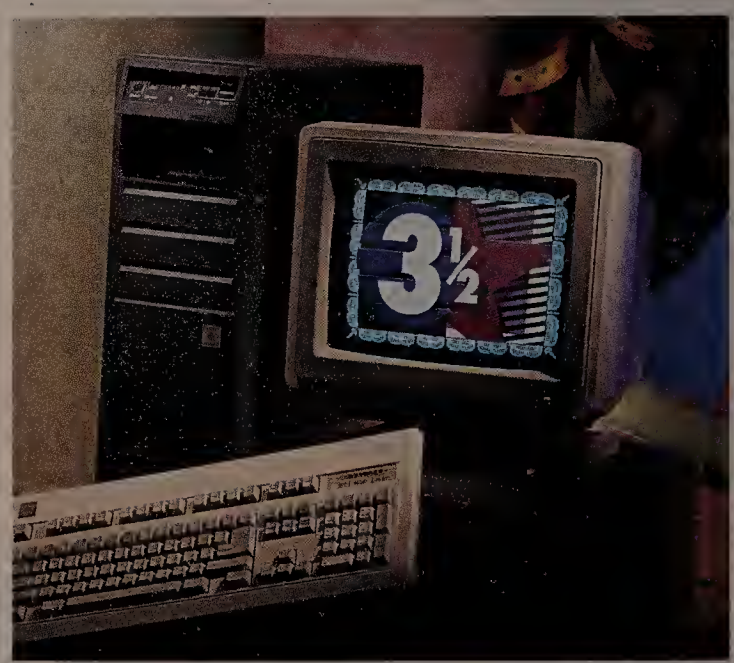

**Expandable and ergonomically exquisite, the Dell PowerLine might have earned a Best Buy if it cost less.**

## Everex Step 486SX/20

**PROS:** Excellent drive and slot capacity, Windows included
**CONS:** Large size

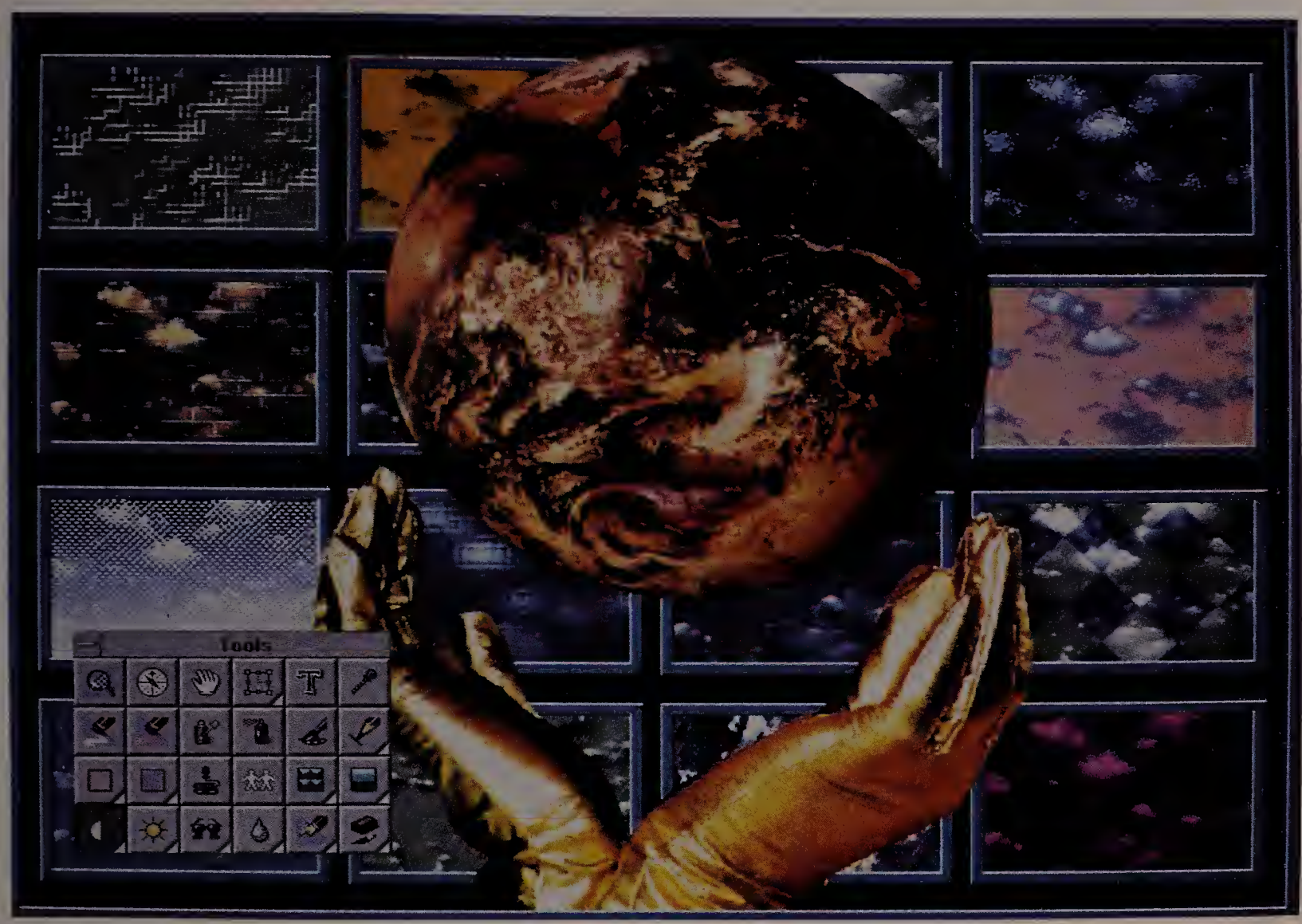
If you're looking for a low-cost file server, the $3454 Everex Step 486SX/20 tower fits the bill. With a 250-watt power supply and six drive bays, it gives you tremendous flexibility in choosing storage options, and upgrading the CPU is as easy as snapping in a new CPU board. Nor is the Step locked in as a server: You can also buy it in a desktop case.

The bays are easy to reach near the top of the chassis, and the power switch and reset button are convenient, too. LED diagnostics make troubleshooting easier, and tech support is available 12 hours a day, though you'll have to pay for the long-distance call. If you *still* can't solve a problem, the system comes with a one-year on-site service contract. The Step is a smart choice for anyone who needs plenty of elbowroom for expansion boards and data storage, which includes anyone with a LAN server in his or her buying plans.




**Everex's mighty tower is a Step in the right direction. With its super drive capacity, it makes sense as a network server.**

# Publisher's Paintbrush
## Image Processing

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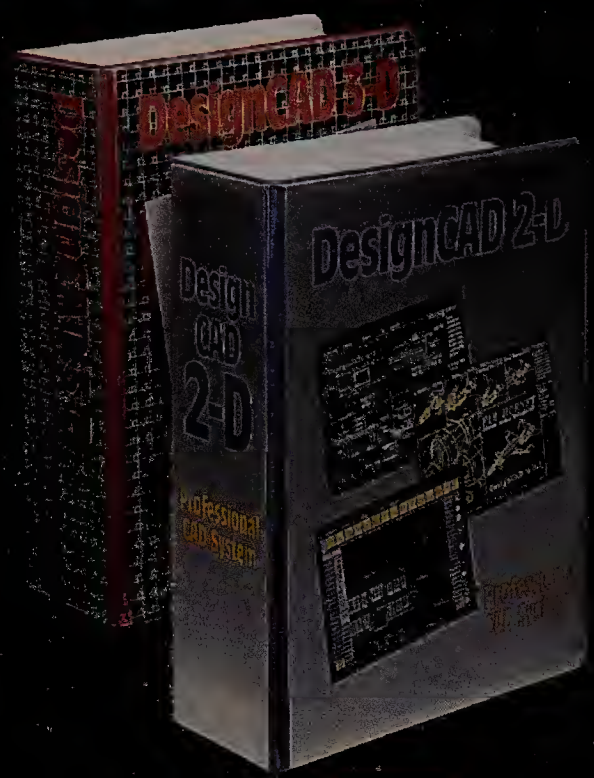
To update, send $75 (add $4.90 shipping/handling) and your original Publisher's Paintbrush program disk to: ZSoft Update, Dept. 2C, 450 Franklin Rd., Suite 100, Marietta, GA 30067. Specify 5.25" or 3.5" disk. GA residents add (3%) sales tax. Canadian customers add $15.90 for air shipping. Outside N. America, add $15.90 for surface shipping, $24.90 via air. Payment in U.S. funds by check, money order, VISA, MC or AX. Upgrades from all ZSoft PAINT programs available; call for details. (404) 428-0008.

**Circle 320 on reader service card**

# GO FIGURE!

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PC MAGAZINE EDITORS' CHOICE

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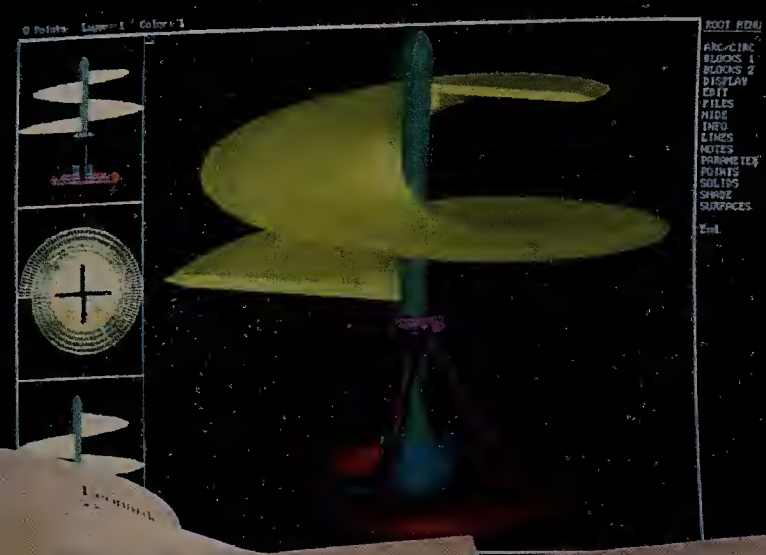
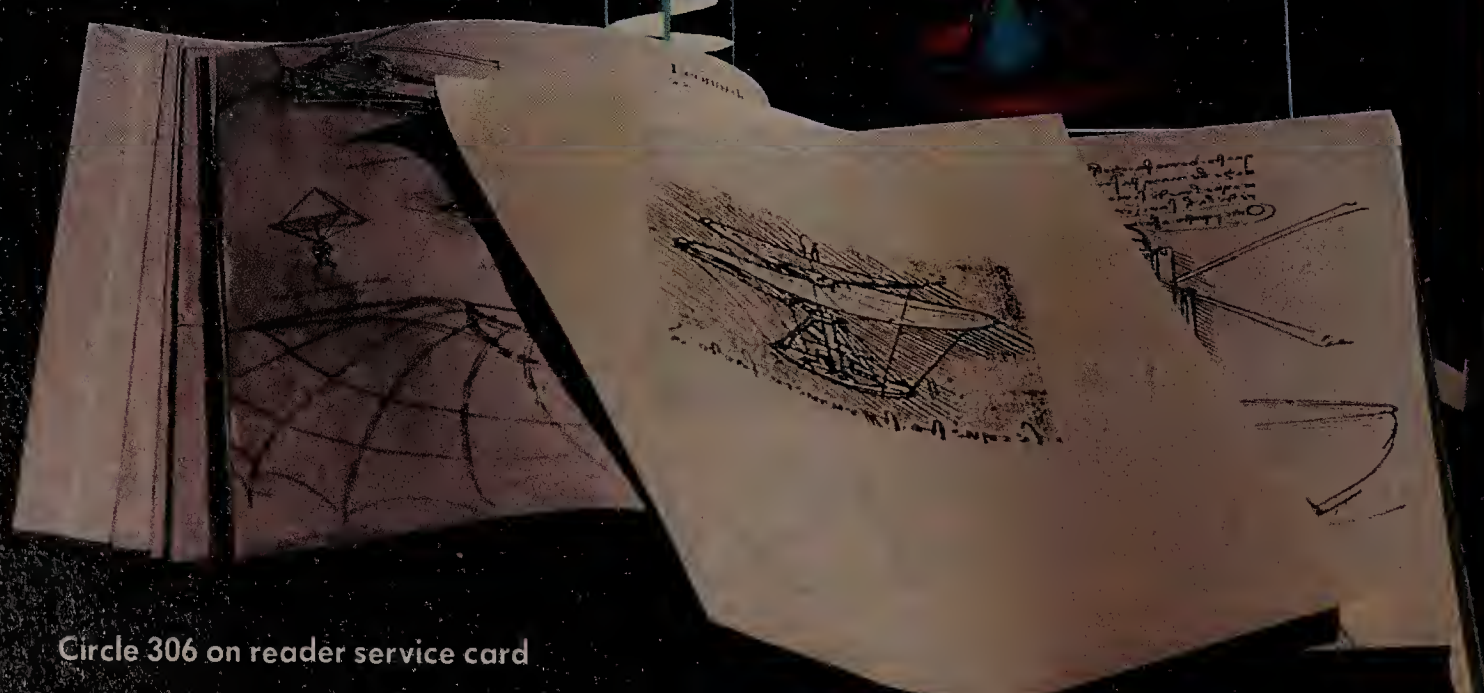




Circle 306 on reader service card

FEATURES EVALUATION

# Look to the Future With a 486SX

*This first batch of 486 systems shows a clear move toward upgradable CPUs: Just switch a chip or slide in a board and you'll have a more powerful 486. Another trend is more 32-bit slots and Windows bundles.*

● Yes
○ No

| | AcerPower 486SX | ALR Business VEISA 486SX | AST Premium II 486SX/20 | Dell PowerLine 420DE | Everex Step 486SX/20 | Everex Tempo 486SX/20 | IBM PS/2 Model 90 XP 486 SX | Mitac 4270E | Reply Model 32 486SX/20 | Tangent 420S | Tri-Star Flash Cache 486/20sx |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard features** | | | | | | | | | | | |
| Street price[1] | $3464 | $5600[2] | $3841[3] | $4359 | $3454 | $3195 | $6647[4] | $3737 | $4055 | $2539 | $2257 |
| External memory cache | n/a | 64K | n/a | n/a | 256K | 128K | n/a | 256K | n/a | 128K | 64K |
| EISA bus | ○ | ● | ● | ● | ○ | ○ | ○ | ● | ○ | ○ | ○ |
| Windows included | ● | ○ | ● | ○ | ● | ● | ○ | ○ | ○ | ● | ● |
| **Expandability** | | | | | | | | | | | |
| Free 32-bit slots | 0 | 3 | 2[5] | 6 | 0 | 0 | 3 | 4 | 5 | 0 | 0 |
| Free 16-bit slots | 4 | 1 | 2 | 0 | 5 | 5 | 0 | 0 | 0 | 5 | 5 |
| Free 8-bit slots | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| Accessible/internal drive bays | 4/0 | 3/1 | 3/2 | 3/2 | 4/2 | 3/1 | 3/1 | 3/1 | 3/2 | 3/1 | 3/2 |
| Largest hard disk option | 338MB | 1.26GB | 210MB | 650MB | 1.6GB | 360MB | 1.2GB | 660MB | 1.2GB | 1.2GB | 1.2GB |
| Upgradable CPU | ● | ● | ● | ● | ● | ○ | ● | ○ | ● | ○ | ○ |
| Fast-RAM capacity | 98MB | 49MB | 80MB | 48MB | 64MB | 32MB | 32MB | 64MB | 128MB | 64MB | 32MB |
| Accepts standard SIMMs | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Design and construction** | | | | | | | | | | | |
| Switchless setup | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Setup utility in ROM | ● | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ● |
| Compact footprint | ● | ● | ● | ● | ○ | ○ | ○ | ● | ● | ● | ● |
| Tilt-and-swivel monitor | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Front panel on/off switch | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ○ | ● |
| Parallel/serial/mouse ports | 1/2/1 | 1/1/1 | 1/2/1 | 1/2/1 | 1/2/0 | 1/2/0 | 1/2/1 | 1/2/1 | 3/2/1 | 1/2/0 | 1/2/0 |
| **Service and support** | | | | | | | | | | | |
| Warranty (months) | 24 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 24 |
| On-site service available | ●[6] | ●[6] | ●[6] | ● | ● | ●[7] | ●[6] | ● | ○ | ● | ● |
| Turnaround policy | 5 days | 72 hours | 1-3 days[8] | 96 hours | 48 hours | 48 hours | ○ | 72 hours | 72 hours | 48 hours | 72 hours |
| Free unlimited support | ○ | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ● |
| Vendor support | | | | | | | | | | | |
| Central support/toll-free | ○/○ | ●/○ | ●/● | ●/● | ●/○ | ●/○ | ○/○ | ●/● | ●/● | ●/● | ●/● |
| Daily support (hours) | ○ | 9 | 11 | 14 | 12 | 12 | ○ | 8 | 11.5 | 8.5 | 14 |
| Weekend support | ○ | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| Electronic BBS/fax | ○/○ | ●/● | ●/● | ●/● | ●/● | ●/● | ○/○ | ●/● | ●/● | ●/● | ●/● |
| Vendor-to-dealer support | | | | | | | | | | | |
| Dedicated support staff required | ○ | ○ | ● | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ |
| Support staff training required | ● | ○ | ● | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ |
| Dedicated support line for dealers | ● | ● | ● | ○ | ● | ● | ● | ○ | ○ | ● | ○ |
| Inventory and parts requirement | ● | ● | ● | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ |
| | | | BEST BUY | | | | | | | | |

[1] Except as noted, price based on 4MB RAM, 100MB to 200MB hard drive, 1.2MB 5¼-inch or 1.44MB 3½-inch floppy drive, VGA and color monitor, one parallel and two serial ports or one serial and one mouse port, 101-key keyboard, mouse, and DOS 5.0. If vendor doesn't offer a mouse, we add $99 to the street price to represent the cost of a basic Microsoft Mouse.

[2] Estimated street price.

[3] With 210MB drive.

[4] With 80MB hard drive and XGA graphics.

[5] Cupid slots.

[6] Extra-cost option.

[7] Three months only.

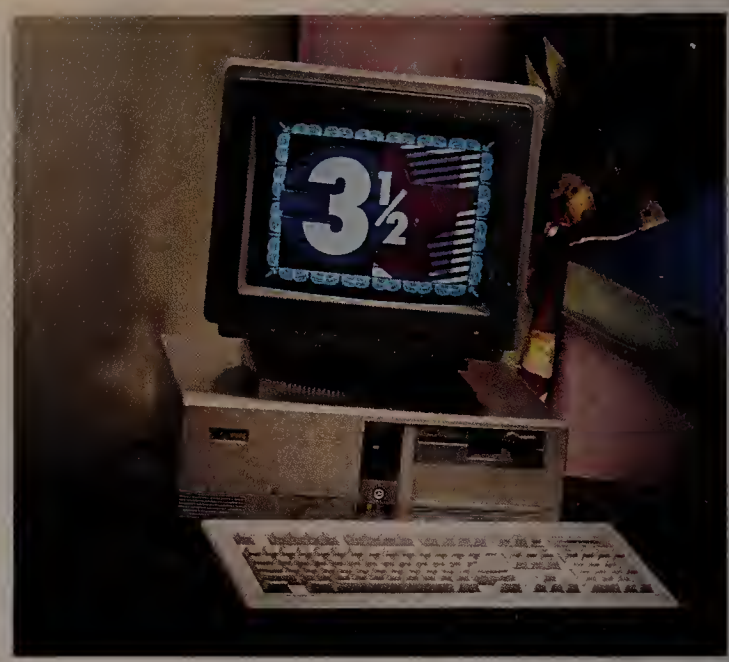
[8] Through service center; 7–10 days through AST.

## Everex Tempo 486SX/20

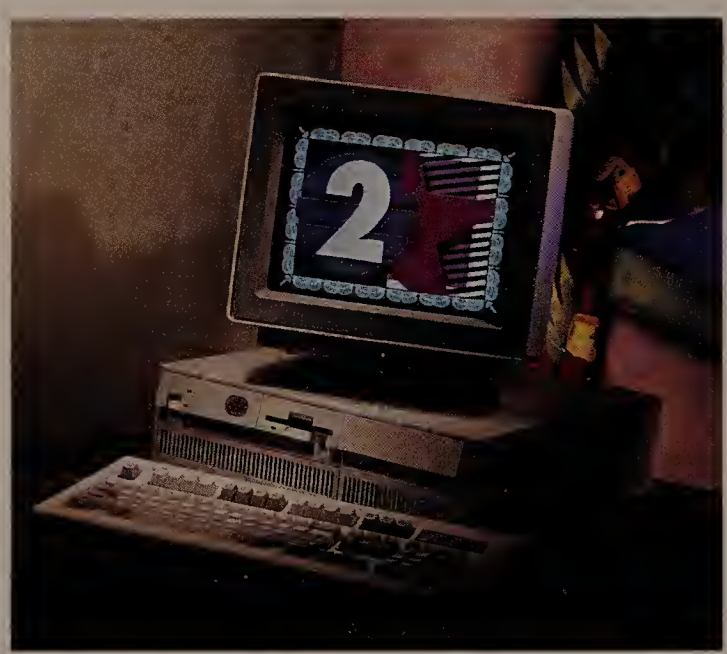
**PROS:** Inexpensive, good support, Windows included
**CONS:** Power switch hard to reach, no CPU upgrade

The $3195 Everex Tempo has a lot in common with its bigger (and more expensive) brother, including respectable performance scores, especially on *Windows*. The main differences are a smaller (but by no means small) 32MB fast-RAM limit, no CPU upgrade path, no diagnostic display, two fewer drive bays, and only three months of free on-site service (compared to the Step's full year).

Everex has included a sliding panel to protect the reset and speaker shut-off buttons, and the documentation is well written with lots of useful diagrams. You can even choose between a standard AT case or a smaller baby AT chassis. Our only complaint is the hard-to-reach power switch in the back right-hand corner of the machine. If you can live with a smaller complement of drives and without a CPU upgrade path, the $250 savings and faster performance make this a tempting choice.




**Everex's Tempo 486SX/20 isn't as expandable as the Step, but it's cheaper and faster and offers similar great service policies.**




**IBM's Model 90 XP 486 SX is superbly designed and has XGA graphics. Sadly, it runs like a 386 and is priced like a 486DX.**

## IBM PS/2 Model 90 XP 486 SX

**PROS:** XGA graphics, SCSI port, easy-open case
**CONS:** Slow, expensive

IBM's PS/2 Model 90 XP 486 SX was one of the first 486SX machines —and one of the most expensive. At $6647 (with an 80MB hard drive), it's still quite pricey and one of the slowest in this roundup. The Model 90 clocked in below average on all our tests except *1-2-3* and *Windows*.

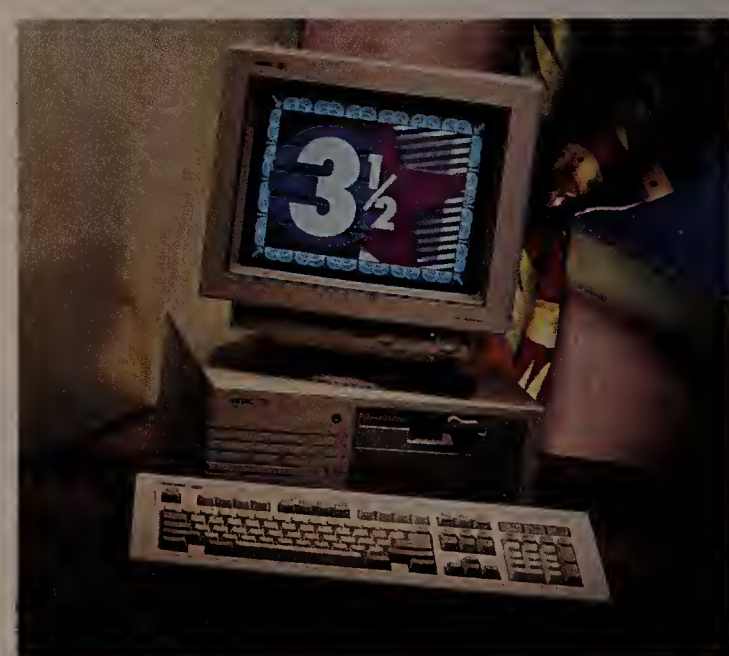
Nonetheless, the Model 90 delivers some significant benefits. Its Micro Channel bus allows easy configuration of peripherals, the SCSI port lets you attach a CD ROM drive or a chain of multiple hard drives, the easy-open case is a pleasure, and the keyboard has that unmistakable IBM feel. Furthermore, the XGA graphics make presentations look terrific. IBM doesn't offer direct technical support, though it does require its dealers to meet stringent support standards. Still, given the Model 90's high price and modest disk system, you'll find better values elsewhere in this roundup.

## Mitac 4270E

**PROS:** Good price, excellent support, good Windows performance, EISA bus
**CONS:** No CPU upgrade, only four free slots

Of the three EISA machines in this roundup, the Mitac 4270E boasts the lowest price: $3737. And while its overall performance was only average, the 4270E raced into first place on our *Windows* benchmark. Design and engineering are impressive too: Both the reset button and the power switch are at the front of the machine, and the keyboard is first-rate. In fact, this impressive system has only two real drawbacks—lack of a CPU upgrade path and a slightly stingy free-slot count.

The 4270E comes with a free one-year on-site service contract and a toll-free number for tech support. Moreover, we were impressed with the techies' friendly, helpful attitude. If you need a good EISA machine with superior support and a nice price, this is it, especially if you spend a lot of time in *Windows*.




**The EISA-based Mitac 4270E makes sense for Windows users looking for service and support plus friendly design.**

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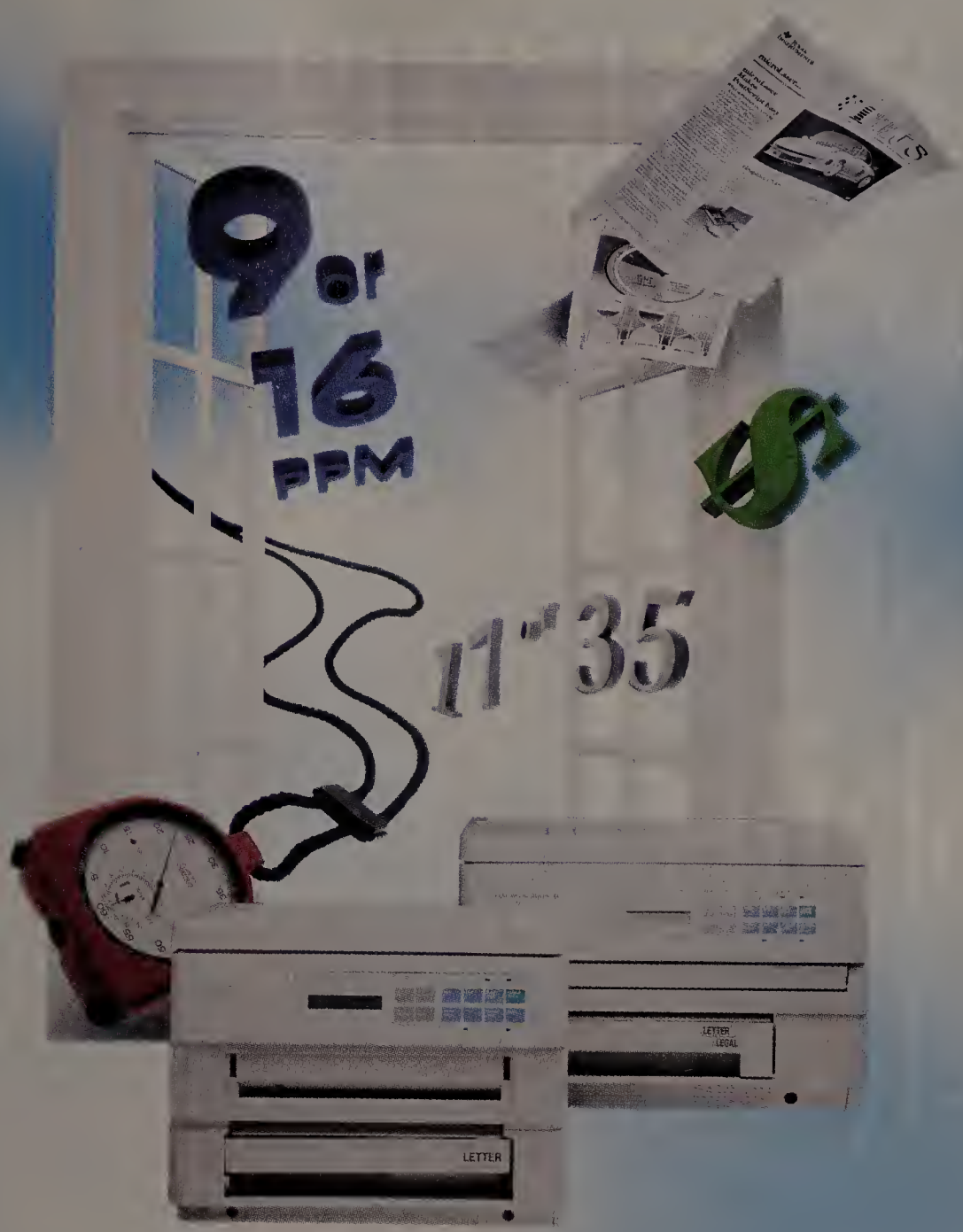


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When it comes to print speed, the new microLaser Plus zips along at 9 ppm. If you need a shared printer solution, turn to the 16 ppm microLaser XL.

If all that isn't enough, just look at what else you get with microLaser. It's the smallest printer in its class. It handles more paper and envelopes in more ways. And it supports more than 4,000 software packages, including your Windows applications.

So when you add it all up, you'll understand why the power of your ideas needs the power, convenience and economy of microLaser. Let microLaser open new windows for you.

For the name of the nearest dealer, call **1-800-527-3500.**

TEXAS INSTRUMENTS

*TI suggested retail price. (Dealer prices may vary.) microLaser is a trademark of Texas Instruments Incorporated. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. Adobe, PostScript and the PostScript logo are registered trademarks of Adobe Systems, Inc. © 1991 TI 71860

**Circle 295 on reader service card**

# Introducing The First Mobile Disks.

## Our new 40 to 120MB portable hard drives are on the move.

Now, wherever you go, take advantage of these great Mobile Disk features.

**Snap on a hard drive in three minutes.** You don't need tools. You don't have to open the computer. Simply plug Mobile Disk into any portable or PC parallel printer port and plug your printer into Mobile Disk. The software configures itself, and you're ready to go.

**Small and sturdy.** Mobile Disk is so durable and light, you can carry it all day and hardly notice it's there.

**Carry all your data with you.** You'll always have the right files, programs, and fonts at the right time. Take your files home, to your portable, or down the hall. Why carry files on floppies, when you can take your whole work environment with you?

**Grows with you.** Add 40, 80, or 120 megabytes of data storage as you need it. Connect up to four drives for maximum storage. It's quick and easy.

**Easy backup.** Copy critical files to Mobile Disk, or back up an internal hard drive without learning new software. Protect your data from fire or damage. Lock it up, safely.

## $399
## Special Introductory Offer!

*For a limited time, you can order Mobile Disk 40 for just $399. Call today to order, or for more information:*

**1-800-821-2151**

**SYSGEN**

Sysgen, Inc. 556 Gibraltar Drive, Milpitas, CA 95035.
Sysgen is a registered trademark, and Mobile Disk is a trademark of Sysgen, Inc. Promotional offer ends December 31, 1991. $399 price includes drive, cable, power supply, and documentation. All Sysgen products are covered by a 12 month warranty

Circle 262 on reader service card

# 20-MHz/25-MHz 486SXs: Best of the Rest

*The 486SXs just keep on coming. Here's an up-to-the-minute listing of the systems that arrived too late for review—including a comparative rundown of vital statistics.*

| Name | List price[1] | Fast-RAM capacity | 32-bit slots free | 16-bit slots free | 8-bit slots free | Drive bays | Compact footprint | Warranty (months) | On-site service |
|---|---|---|---|---|---|---|---|---|---|
| ALR BusinessStation 486ASX Model 200-DMA | $4667 | 33MB | 2 | 1 | 0 | 3 | Y | 12 | Y |
| ALR MPS 486ASX Model 200-5 | $6192 | 17MB | 2 | 3 | 0 | 5 | N | 12 | Y |
| ALR PowerFlex 486ASX | $4716 | 5MB | 0 | 6 | 1 | 4 | N | 12 | Y |
| BLK 486SX/20 | $2745 | 32MB | 0 | 4 | 2 | 5 | N | 12 | Y |
| Copam 486SXB/20 | $3459 | 16MB | 0 | 5 | 0 | 4 | Y | 12 | Y |
| Eltech Model 4200 | $2179 | 32MB | 0 | 5 | 0 | 5 | Y | 12 | Y |
| Hewlett-Packard | $6767 | 64MB | 4 | 0 | 0 | 4 | N | 12 | Y |
| Hyundai 486SX/20 | $4090 | 64MB | 0 | 6 | 0 | 3 | Y | 18 | Y |
| Memorex Telex Model 7480 | $6520 | 64MB | 4 | 0 | 0 | 4 | N | 12 | Y |
| NCR 3335[2] | $6043 | 128MB | 4 | 0 | 0 | 3 | Y | 12 | Y |
| NEC PowerMate 486SX/20e | [3] | 64MB | 5 | 0 | 0 | 5 | N | 12 | N |
| Northgate 486SX/20MHz | $2899 | 32MB | 0 | 4 | 2 | 5 | N | 12 | Y |
| Packard Bell 486SX | $3394 | 32MB | 0 | 4 | 0 | 4 | [3] | 12 | Y |
| Samsung DeskMaster 486S/20 | $3244 | 32MB | 0 | 4 | 0 | 5 | Y | 12 | Y |
| Swan Technologies 486SX | $2695 | 32MB | 1 | 4 | 1 | 4 | Y | 24 | Y |
| Twinhead Superset 600/420C Model 1050V | $3759 | 32MB | 0 | 4 | 0 | 4 | Y | 12 | Y |
| Zenith Z-486SX/20 | $5799 | 32MB | 3 | 0 | 0 | 3 | Y | 12 | Y |
| Zeos 486SX-20 | $2695 | 32MB | 0 | 6 | 1 | 7 | N | 12 | Y |

[1] Price based on 4MB–5MB RAM, 100MB or larger hard disk, at least one 1.2MB (or 1.44MB 3½-inch) floppy drive, VGA card and color VGA monitor, at least one parallel and two serial ports or one serial port and one mouse port, 101-key keyboard, mouse, and DOS 3.3 or later version. If the vendor doesn't offer a mouse, we added $125 to the list price.
[2] 25-MHz system.
[3] This information not available at press time.

## WHERE TO BUY

**Advanced Logic Research**
9401 Jeronimo
Irvine, CA 92718
800/444-4257,
714/581-6770
**Reader service no. 758**

**Austin Computer**
10300 Metric Blvd.
Austin, TX 78758
512/339-7932
**Reader service no. 808**

**Blackship Computer**
2031 O'Toole Ave.
San Jose, CA 95131
510/770-9300
**Reader service no. 809**

**Copam USA**
45875 Northport Loop E
Fremont, CA 94538
510/623-8911
**Reader service no. 810**

**Eltech Research**
47266 Benicia St.
Fremont, CA 94538
415/438-0990
**Reader service no. 811**

**Hewlett-Packard**
Customer Information Center
19310 Pruneridge Ave.
Cupertino, CA 95014
800/752-0900
**Reader service no. 812**

**Hyundai Electronics America**
Information Systems Division
166 Baypointe Pkwy.
San Jose, CA 95134
408/473-9200
**Reader service no. 813**

**Memorex Telex**
6929 N. Lakewood Ave.
Tulsa, OK 74117
800/331-2623
**Reader service no. 814**

**NCR Corp.**
1700 S. Patterson Blvd.
Dayton, OH 45479
800/225-5627,
800/637-2600
**Reader service no. 815**

**NEC Technologies**
Consumer Products Division
1414 Massachusetts Ave.
Boxborough, MA 01719
800/632-4636
**Reader service no. 816**

**Northgate Computer Systems**
7075 Flying Cloud Dr.
Eden Prairie, MN 55344
800/548-1993,
612/943-8338
**Reader service no. 817**

**Packard Bell**
9425 Canoga Ave.
Chatsworth, CA 91311
818/773-4400,
818/773-9516
**Reader service no. 818**

**Samsung Information Systems America**
3655 N. First St.
San Jose, CA 95134
800/624-8999
ext. 851
**Reader service no. 819**

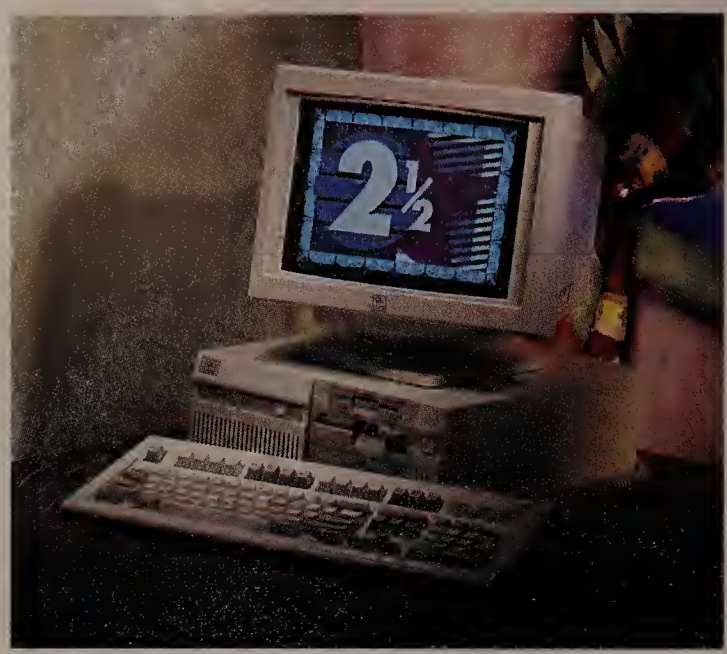
**Swan Technologies**
3075 Research Dr.
State College, PA 16801
814/238-1820
**Reader service no. 820**

**Twinhead Corp.**
1537 Centre Pointe Dr.
Milpitas, CA 95035
800/545-8946
**Reader service no. 821**

**Zenith Data Systems**
2150 E. Lake Cook Rd.
Buffalo Grove, IL 60089
800/553-0331
**Reader service no. 822**

**Zeos Int'l**
530 5th Ave. NW
St. Paul, MN 55112
800/423-5891
**Reader service no. 823**

**For more information about all products in this sidebar, circle reader service no. 909.**



Reply's small-footprint PS/2 clone has a nice design and surprisingly generous expandability, but it's slow for the money.

## Reply Model 32 486SX/20

**PROS:** Excellent design, plenty of free slots and bays, huge RAM capacity
**CONS:** Slow disk performance despite high price

If a PS/2 looks good to you but you can't afford IBM's Model 90, take a look at Reply's $4055 Micro Channel Model 32. The Reply's PS/2 compatibility is impressive; even the keyboard is indistinguishable from IBM's. Unfortunately the Model 32 lacks the IBM's XGA graphics and SCSI port, and it came in dead last overall in performance.

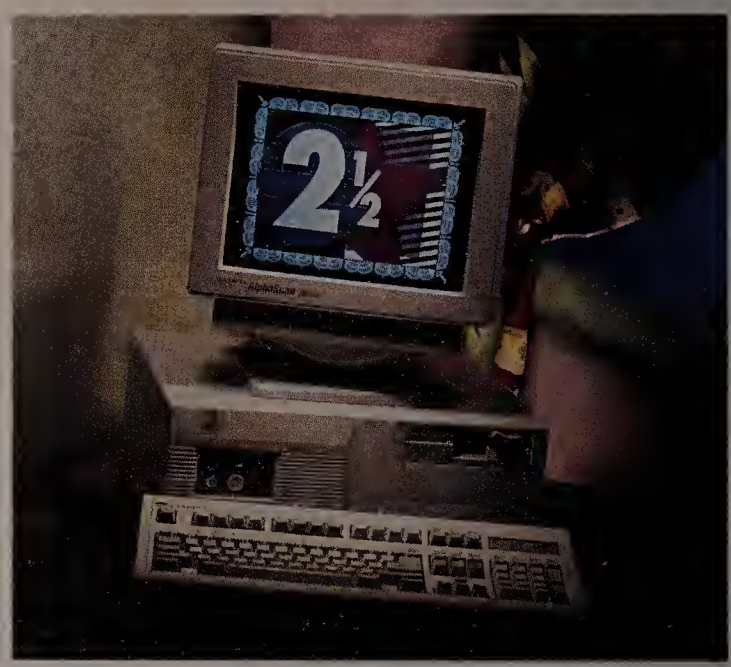
Its design is excellent, however: It has front-mounted power and reset buttons, a fine keyboard, and an easy-open chassis. And while the Model 32 boasts the smallest case in the roundup (only 5½ inches high), it's surprisingly expandable and a snap to upgrade. Reply's dealers do not necessarily maintain a dedicated support staff, but you can get support directly from the company. So if you need a Micro Channel 486SX, and top speed is not a priority, the Reply can do the job for about $2600 less than Big Blue.

## Tangent 420S

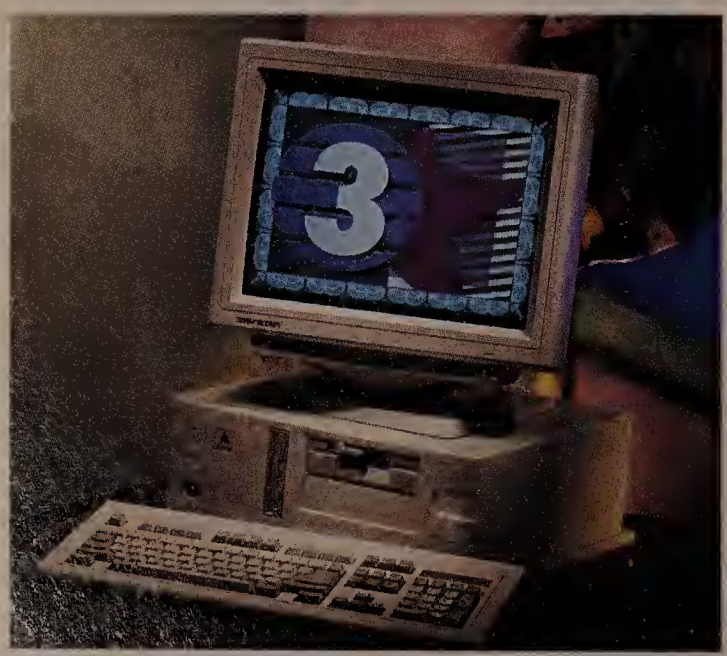
**PROS:** Inexpensive, excellent support, Windows included
**CONS:** Compatibility problems

You can take a Tangent 420S home for $2539 and get a free copy of *Windows*. Still, the system's minuses outweigh its pluses: The power switch is hard to reach, and we ran into compatibility problems. For instance, we couldn't disable the COM1 port when we tried to install an internal modem (we finally had to remove the board). Nor was the documentation of much use. Finally, although typing "touch" is a personal matter, the keyboard was too mushy for our taste.

The Tangent is reasonably generous with slots and bays, and you get a year of free on-site service plus superb toll-free technical support—but that's just not enough to balance the books. Despite a power switch that's an arm's length away, the inability to disable COM1, and a soft keyboard, the Tangent is a real bargain—but not the best bargain in this roundup.



Hampered by design and compatibility problems, the Tangent's overall rank is bolstered by dynamite support and low price.



A fully configured 486 for only $2257? You read it here first: The Tri-Star performs well and it's a bargain hunter's dream.

## Tri-Star Flash Cache 486/20sx

**PROS:** Lowest price in roundup, excellent support
**CONS:** Inconsistent documentation

Tri-Star's Flash Cache 486/20sx boasts a rock-bottom price—only $2257 including *Windows*—an outstanding capacity for boards and drives, a huge hard disk option, and an impressive service-and-support package. That's almost enough to put this small-footprint ISA system on the trail to a Best Buy, but its less than optimum performance on data bases shoots it from the saddle.

The keyboard is too mushy, the case could be easier to open, and the manual includes some mistakes. But the super support package includes a two-year warranty and a free one-year on-site service contract. Tri-Star also provides top-notch toll-free technical support 14 hours a day, and responses to our questions were first-rate. Despite its relatively slow performance on data bases, the pluses on this machine are so compelling that we're inclined to say: Go for it!

# SORRY, QEMM.

## THERE CAN ONLY BE ONE WINNER.

And when it comes to memory management, PC Magazine picked NETROOM over QEMM and all the rest.

Why? Because NETROOM gives you up to 576K more memory by relocating LANs, device drivers, and TSRs, not only into High-DOS *between* 640K and 1Mb, but also into expanded or extended memory *above* 1Mb.

And, NETROOM is the only memory manager that runs on all PCs – 8088 through 80486. Not just with LANs, but even on stand-alone PCs!

That's why PC Magazine said "*...it's a real winner...considering NETROOM's price and capabilities, you will find that there is no second choice.*"†

| Features: | NETROOM | QEMM | 386 MAX |
|---|---|---|---|
| Windows 3.0 support | ✔ | ✔ | ✔ |
| Special DOS 5 support | ✔ | | |
| Converts Ext. to Exp.* | ✔ | ✔ | ✔ |
| Relocates to High-DOS | ✔ | ✔ | ✔ |
| Relocates to LIM 3.2 Frame | ✔ | | |
| Relocates to Expanded | ✔ | | |
| Relocates to Extended | ✔ | | |
| Works on 386/486 | ✔ | ✔ | ✔ |
| Works on 8088/286 | ✔ | | |
| Memory Analysis Utility | ✔ | | |

*Requires NEAT CHIPSet on 286 systems.

## NOW, VER. 2 WITH DOS 5 SUPPORT!

You'd think we'd leave good enough alone. But we made NETROOM even better. With special DOS 5 support like 286 expanded memory support, installation support through on-screen hot-key help, and more.

Plus, with NETROOM you get the essential memory analysis utility DISCOVER, a diagnostic tool that unveils the hidden potential of your PC!

## SPECIAL LIMITED TIME OFFER!

QEMM users, don't despair. Just send us the title page from QEMM, or any memory manager manual, and you'll save 50% off the regular price of NETROOM.

But hurry, this is a limited time offer – and as you probably know, everyone loves a winner!

Call toll-free **1-800-451-0551**, fax (718) 392-4212, or mail coupon to:
**HELIX SOFTWARE CO. – SPECIAL OFFER**
47-09 30th St., L.I.C., N.Y. 11101 (718) 392-3100

**YES!** Please send me NETROOM for:
☐ 1 user $99 + $5 s&h ☐ 4 user $179 + $5 s&h

**YES!** I'd like to save 50% and trade up to NETROOM (1 user). I've enclosed the title page of any memory manager and $49.50 + $5 s&h.

☐ Check ☐ MC ☐ Visa Exp._____

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Name_____

Address_____

City_____ State_____ Zip_____

Phone ( )_____

NYS res. add 8¼% sales tax. Allow 2-4 weeks for delivery.

**HELIX SOFTWARE COMPANY**

To support all of NETROOM's features on 8088/286 PCs you will need NEAT CHIPSet or expanded memory hardware.

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Circle 111 on reader service card

# Prevent Viruhackaphobia

What was once laughed off as "pranksterism" has become a plague. The combined threat of viruses wreaking havoc on your company's PCs and probing hackers gaining access to sensitive data, can create Viruhackaphobia among even the most mild mannered PC managers. Relax... XTree Company has the cure. In fact, we wrote the book on it.

## Destroy The Fearsome Beasts In Your PC With ViruSafe™

According to industry experts, "one out of every ten businesses has experienced a virus infection." While most anti-virus products simply scan for known virus signatures, ViruSafe actually looks for the signs of viruses attempting to replicate. Once a virus is spotted, ViruSafe wipes it out, whether it is *known* or *unknown*. By isolating the unknown virus in memory, ViruSafe studies it and learns its signature immediately, letting you *automatically* update the virus signature database. Then you can use ViruSafe to scan other disks or systems right away before an infection can spread, without waiting for a new signature from the software publisher. So, if you use a standalone PC, fear not. It's over for the beastly virus.

## Prevent Mass Viruhackaphobia With ViruSafe/LAN™

ViruSafe/LAN has all the same great features of ViruSafe but adds new warning systems for the network administrator. Also included are reporting features that keep the administrator up to date on the status of the virus check. And ViruSafe/LAN runs automatically, manually, or on a time scheduled basis. With ViruSafe/LAN, the fear of mass destruction is history.

## Introducing AllSafe,™ The End Of All Dastardly Doers

Just as evil and destructive as the viruses are those characters that attempt to invade your computer files without authorization. When you need a *complete* solution - protection against both viruses *and* unauthorized entry - choose AllSafe, with the superior virus protection of ViruSafe teamed with access control and security reporting. Flexible password options let you share or limit access to as much of your hard disk as you wish. You're in total control. AllSafe means the end of VIRUHACKAPHOBIA. And like all XTree Company products, they're easy to install and use. For more information, call **1-800-843-6888 ext. 537**. In Canada **416-866-8592**. Outside the U.S. **805-541-0604**.

XTREE
COMPANY

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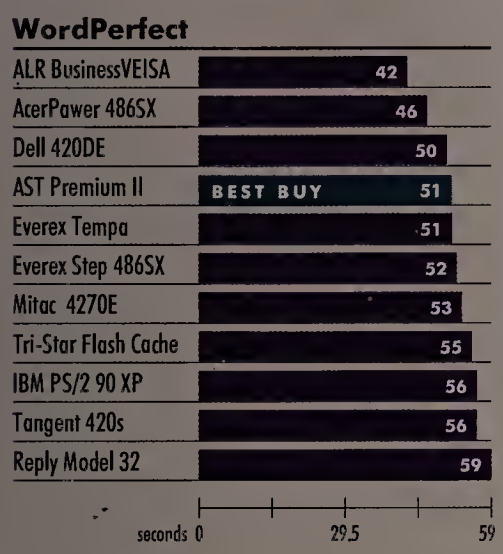
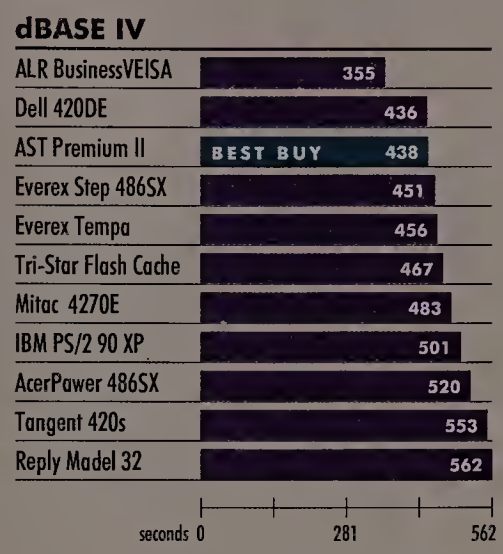
**Circle 319 on reader service card**

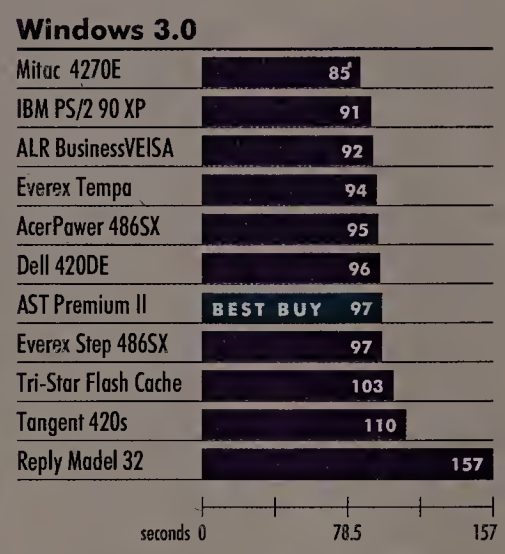
PC WORLD TEST REPORT

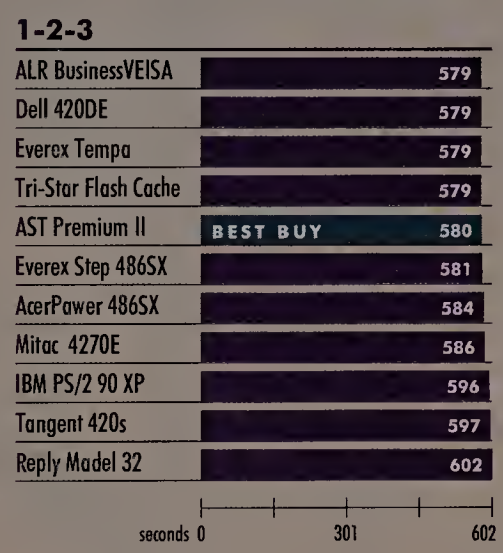
# Straight A's for Acer, ALR, and AST

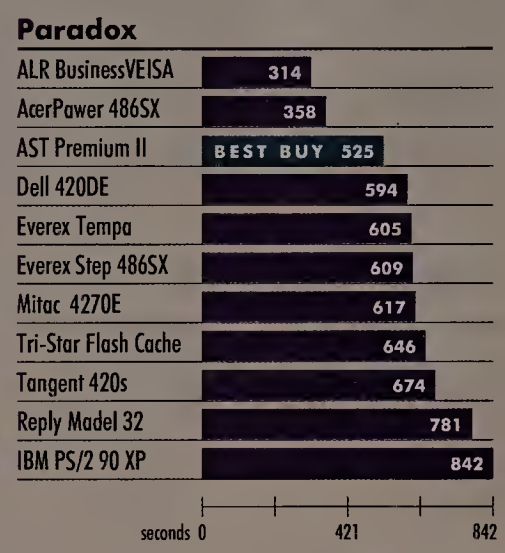
*Despite the modest 20-MHz clock rate, most of these 486SXs zip through business applications at top speed—even a bit faster than a flying 386 33 MHz.*




**Methodology**
We tested all the computers with 4MB RAM except the ALR BusinessVEISA, which had 5MB RAM. The systems' hard disk size ranged from 105MB to 210MB. We used the vendor's version of DOS.

**WordPerfect**
We reformat three *WordPerfect 5.1* documents that vary in size from 5K to 55K. The files are text with some boldface and underlining; one document includes a TIFF image.

**dBASE IV**
With the caching feature enabled, we complete an unindexed search for a single record in a 100,000-record parts table. Then we index the table, run the transaction processing module, and post 600 records.

**Windows 3.0**
Timing begins and ends at the DOS prompt. We launch *Windows* along with a macro that loads *Microsoft Excel* with a financial worksheet and initiates a recalc. Then the macro loads *Ami Pro* along with a 50K document that contains a 500K TIFF image. Finally, the macro launches *Micrografx Designer*, opens a drawing, displays it on screen, and exits to DOS.

**1-2-3**
We load the application, followed by three separate worksheets (arithmetic, financial, and scientific). We make various changes and run recalcs on each. Finally, we use the *MAPS* add-in from Management Advisory Services of Seattle to run a number of financial forecasts.

**Paradox**
Starting with an orders table, we compare each record with an available stock table. The application finds the current price for the items and inserts the resulting record into an invoice table.

**Data based on tests designed and conducted by the PC World Test Center. All rights reserved.**

## WHERE TO BUY

**AcerPower 486SX**
Acer America
401 Charcot Ave.
San Jose, CA 95131
800/733-2237
LIST PRICE: with 2MB RAM, 1.44MB floppy, one parallel and two serial ports, VGA, 101-key keyboard, PS/2 mouse, DOS 5.0, Windows 3.0 $2495; with 125MB hard disk $2995; with 4MB RAM, 1.44MB floppy, one parallel and two serial ports, VGA, 101-key keyboard $3395; with 125MB hard disk $3995
ACCESSORIES: 4MB RAM $640, 1.2MB floppy $117, 200MB IDE hard disk $1195, 14-inch 1024-by-768 noninterlaced color VGA display $799
**Reader service no. 757**

**ALR BusinessVEISA 486ASX**
Advanced Logic Research, Inc.
9401 Jeronimo
Irvine, CA 92718
800/444-4257
LIST PRICE: Model 101 with 1MB RAM, 1.2MB floppy, one parallel, one mouse, and one serial port, IDE, 101-key keyboard $2795; Model 150 with 5MB RAM, 1.2MB floppy, 150MB ESDI hard disk, one parallel, one mouse, and one serial port, VGA, 101-key keyboard $6195
ACCESSORIES: 1MB RAM $149, 4MB RAM $449; second floppy $175; 200MB IDE hard disk $1295; 800 by 600 VGA adapter $199; 14-inch 800-

# Inside the 486SX

*Michael Goodwin and Karl Koessel*

All the chips in Intel's 486 family—from the imperial 50-MHz 486DX to the proletarian 16-MHz 486SX—share an advanced architecture designed to deliver the best possible performance at any clock speed.

All 486 chips include a small but effective memory cache. When the CPU finds what it needs in the cache, it need not perform a slower access to main memory.

Another advantage 486s have over 386s is an internal "clock doubler" that enables them to work with a slower system clock. The 386 chip needs a clock clicking away at twice the rated chip speed, which creates a problem because fast clocks emit more high-frequency RFI. Moreover, the 386 may take several clock ticks to execute instructions. The 486 chips execute most instructions in just a single tick.

## So Where's the Catch?

Faced with a powerful threat from AMD's low-cost 386/40, Intel wanted to price the new 486SX chip so low that vendors could sell 486SX machines for hundreds of dollars less than 33-MHz 386 PCs and for thousands less than 25-MHz 486DX systems. (See "33-Something: Still Hot After All These Years" for some real-world price comparisons.) But if the 486SX shares the 486DX's radical architecture, how can Intel sell it so cheaply?

The answer is that the math coprocessor has been disabled. All the circuitry is there, but because it's not going to be used, Intel doesn't need to test it—and most of the 486DX's high cost comes from testing that coprocessor. For one thing, floating-point math tests are time-consuming. For another, chip defects that are confined to the floating-point circuitry will never be noticed.

So eliminating the floating-point tests saves money two ways: It speeds testing, and it also reduces failure rates.

**WHERE TO BUY**

by-600 color VGA display $699
**Reader service no. 758**

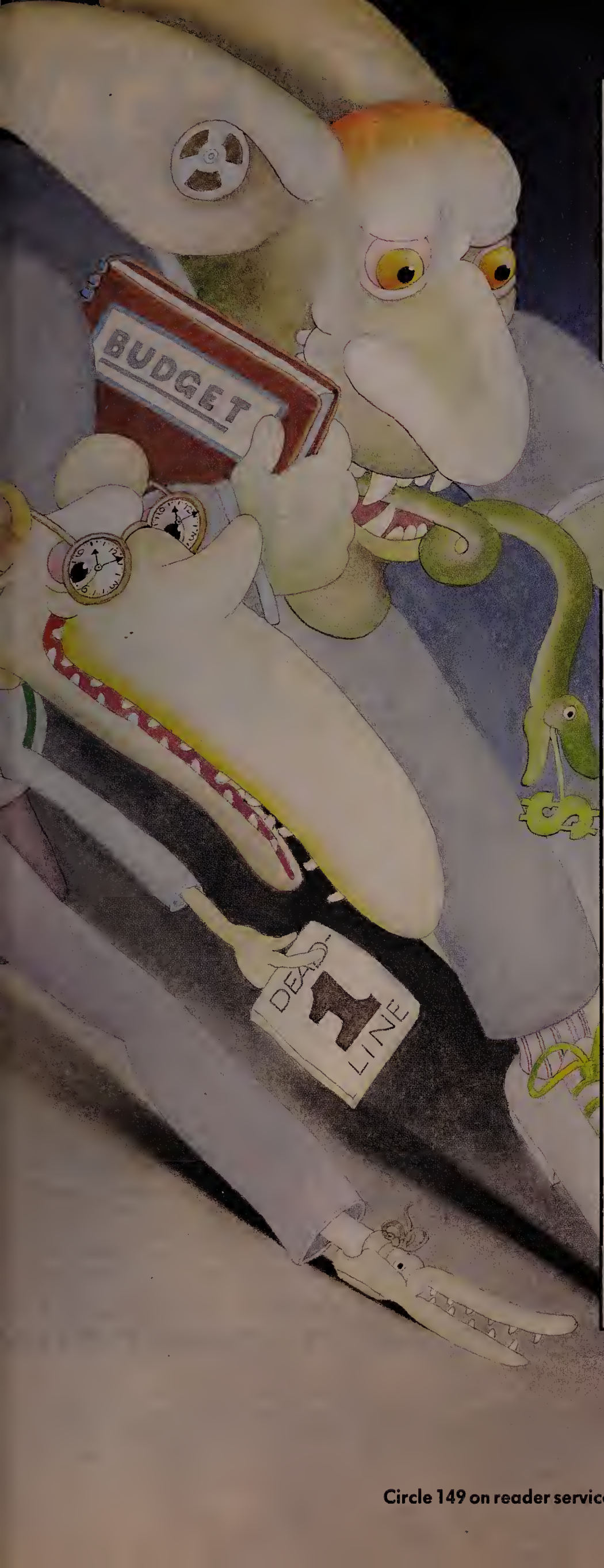
**AST Premium II 486SX/20**
AST Research, Inc.
P.O. Box 19658
16215 Alton Pkwy.
Irvine, CA
92713-9658
800/876-4278
LIST PRICE: with 4MB RAM, 1.44MB floppy, one parallel, one mouse, and two serial ports, VGA, 101-key keyboard $2995; with 80MB hard disk $3495; with 210MB hard disk $3995
ACCESSORIES: 1MB RAM $100; second floppy $150; 210MB hard disk $1375; 1200-by-768 interlaced color VGA display $695
**Reader service no. 759**

**Dell PowerLine 420DE**
Dell Computer
9505 Arboretum Blvd.
Austin, TX
78759-7299
800/289-3355
LIST PRICE: with 4MB RAM, 1.2MB or 1.44MB floppy, 100MB hard disk, one parallel and two serial ports, monochrome VGA display and adapter, 101-key keyboard $3699; with 8MB RAM and 200MB hard disk $4399
ACCESSORIES: 1MB RAM $100; second floppy $99; 320MB IDE hard disk $1399, 330MB ESDI hard disk with controller $1699; 1024-by-768 256-color VGA adapter $199; 14-inch 800-by-600 color VGA display $399; 1024-by-768 interlaced color VGA display $499, 1024-by-768 noninterlaced color VGA display $599; mouse $59.95; DOS 5.0 $89.95
**Reader service no. 800**

**Everex Step 486SX/20, Tempo 486SX/20**
Everex Systems
48431 Milmont Dr.
Fremont, CA 94538
800/992-3839
LIST PRICE: Step 486SX/20 with 1MB RAM, 1.2MB floppy, one parallel and two serial ports, IDE, 101-key keyboard, mouse, DOS 5.0, Windows 3.0 $2999; with 4MB RAM and 100MB hard disk $3988; Tempo 486SX/20 with 1MB RAM, 1.2MB floppy, one parallel and two serial ports, IDE, VGA, 101-key keyboard, mouse, DOS 5.0, Windows 3.0 $2599; with 4MB RAM and 100MB hard disk $3573; with 8MB RAM and 200MB hard disk $4373
ACCESSORIES: 1.44MB floppy $105; 40MB hard disk $389, 338MB hard disk $1999; color VGA display $599; 60MB tape backup $359
**Reader service no. 801**

**IBM PS/2 Model 90 XP 486 SX**
IBM
1133 Westchester Ave.
White Plains, NY
10604
800/426-9292
LIST PRICE: Model OG5 with 4MB RAM, 1.44MB floppy, one parallel and two serial ports, 80MB hard disk, color XGA display and adapter, 101-key keyboard $8345; Model OG9 with 160MB hard disk $8945
ACCESSORIES: 1.2MB external floppy $509, second 1.44MB floppy $263; mouse $101; DOS 5.0 $165
**Reader service no. 802**

**Mitac 4270E**
American Mitac
410 E. Plumeria Dr.
San Jose, CA 95134
800/648-2287
LIST PRICE: with 1MB RAM, 1.2MB floppy, one parallel and two serial ports, IDE, VGA, 101-key keyboard, mouse, DOS 4.01 $2395; with 4MB RAM and 100MB hard disk $3360; with 8MB RAM and 200MB hard disk $4080
ACCESSORIES: 1MB RAM $80; 1.44MB floppy $95, second 1.2MB floppy $95; 100MB hard disk




# Haunted By Project Management Nightmares?

Screaming users. Missed deadlines. Escalating budgets. Incompatible hardware. Resource conflicts. Fuming VPs. It's the stuff nightmares are made of.

Coordinating projects with thousands of tasks and dozens of users across multiple platforms can turn into a bad dream — unless you have Artemis Prestige.

Artemis Prestige is the only project management software that runs on virtually all platforms, including PCs, LANs, UNIX, and VAX workstations, so you avoid both compatibility problems and the purchase of new hardware. Plus, it allows multiple users to access information from activities in the same project — all at the same time — without interfering with each other. Online help and an intuitive interface also make it simple to use. You won't have to worry about security either. Prestige allows you to protect sensitive data by restricting access to designated users.

If your worst nightmares are coming true everyday, try Artemis Prestige. It'll make your job so easy it's scary. For a free demo disk, call today: 1-800-4-PRO-MGT.

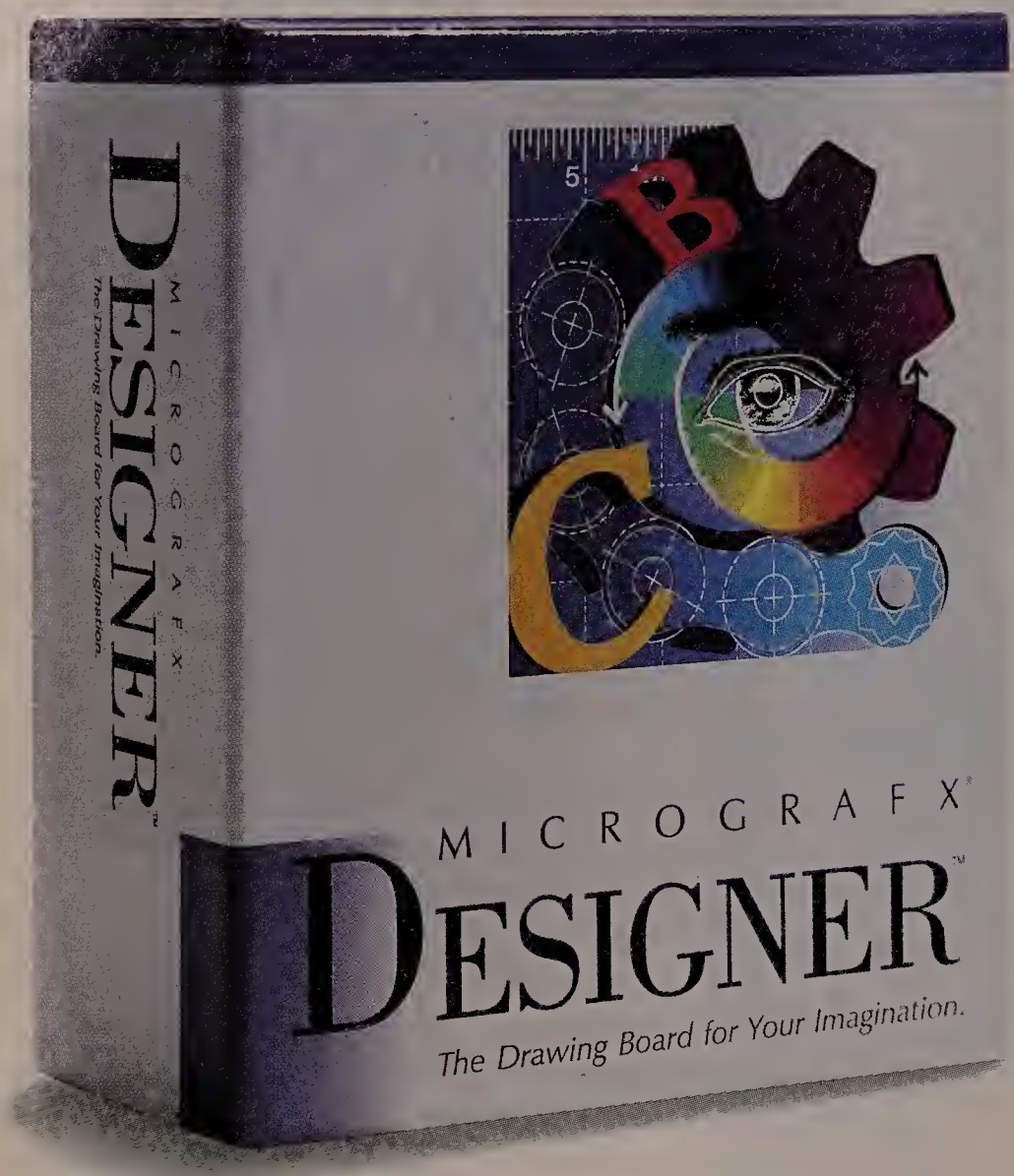
Artemis PRESTIGE

**THE ONLY TRUE MULTI-USER, MULTI-PLATFORM, MULTI-PROJECT MANAGEMENT SOFTWARE.**

Lucas Management Systems

**Circle 149 on reader service card**

# HEFTY HEFTY HEFTY




## WIMPY WIMPY WIMPY

Want to play around? Get Corel Draw. But if your *work depends* on precision drawing, you should realize just how much more you can accomplish with Micrografx Designer.™

*Important* things. Like putting up to 64 layers in your drawings. "Snapping" objects to align them perfectly. And editing drawings on the full screen, in color, instead of a wimpy black-and-white box.

**"Designer is the power user's choice."**
*PC Magazine*
*"Editor's Choice"*

Then there's Designer's poster-size 132″ by 132″ drawing area. Corel's is a mere 17″ by 17″ – leaving you to strip pieces together for larger drawings.

And don't forget clip art. Designer is packed with over 1,700 ready-made illustrations. Corel, only 750.

If you have questions about using Designer, you can turn to help screens *or* our 24-hour telephone support. But you won't find any help screens in Corel Draw. And don't bother to call them after hours.

| Features | Designer | Corel Draw |
|---|---|---|
| Drawing layers | 64 | 1 |
| Dimensioning | Yes | No |
| Object snap | Yes | No |
| Maximum drawing size | 132″ × 132″ | 17″ × 17″ |
| Edit in full color | Yes | No |
| Clip art images | Over 1,700 | 750 |
| Named symbols | Yes | No |
| PageMaker 4.0 filter | Yes | No |
| On line help screens | Yes | No |
| 24 hour support | Yes | No |

**The experts' verdict: "No contest."**
*Software Digest* gave Designer five stars to Corel's three, concluding: ***"Designer provides the best overall free-form graphics package. It offers state-of-the-art features, good performance, and unmatched ease of learning and use in a sophisticated package."***

Why waste your time with a wimpy product when you can really flex your muscles with Designer? Call us today for a *free* working model, or for the location of the dealer nearest you.

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**1-800-487-2116**

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Designer system requirements: 286 (386 recommended) IBM PC or compatible, or PS/2. 1 MB RAM (2 MB RAM recommended). 20 MB (or larger) hard disk. Windows 3.0. DOS 3.1 (or higher). Mouse or digitizing pad. Windows-compatible monitor.

Circle 183 on reader service card

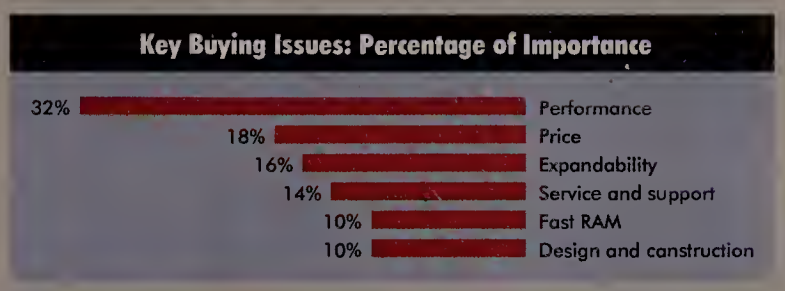
## EXECUTIVE SUMMARY

# Intel's New Chip Finds a Good Home With AST

*The AST Premium II 486SX/20 is the cream of the first crop of 486SX systems.*

BEST BUY

A surprising number of impressive deals emerged from this first batch of 486SX systems, but the Best Buy goes to the speedy, superbly designed **AST Premium II 486SX/20**. But AST isn't the only vendor to put serious thought into its system. Other very good values are available from Acer, ALR, Dell, Everex, and Mitac.




Excellent ★★★★
Good ★★★
Fair ★★
Poor ★

| | Reader service number | Performance | Price | Expandability | Service and support | Fast RAM | Design and construction | Overall value |
|---|---|---|---|---|---|---|---|---|
| **AcerPower 486SX** | 701 | ☆☆☆☆ | ☆☆☆ | ☆☆☆½ | ☆☆½ | ☆☆☆☆ | ☆☆☆½ | ★★★½ |
| **ALR BusinessVEISA 486ASX** | 702 | ☆☆☆☆ | ☆½ | ☆☆☆½ | ☆☆☆½ | ☆☆☆☆ | ☆☆☆½ | ★★★½ |
| **AST Premium II 486SX/20** | 703 | ★★★★ | ★★★ | ★★★★ | ★★★½ | ★★★★ | ★★★★ | ★★★★ |
| **Dell PowerLine 420DE** | 704 | ☆☆☆½ | ☆☆½ | ☆☆☆☆ | ☆☆☆ | ☆☆☆☆ | ☆☆☆☆ | ★★★½ |
| **Everex Step 486SX/20** | 705 | ☆☆☆ | ☆☆☆ | ☆☆☆☆ | ☆☆☆ | ☆☆☆☆ | ☆☆☆½ | ★★★½ |
| **Everex Tempo 486SX/20** | 706 | ☆☆☆½ | ☆☆☆ | ☆☆☆½ | ☆☆☆ | ☆☆☆☆ | ☆☆☆½ | ★★★½ |
| **IBM PS/2 Model 90 XP 486 SX** | 707 | ☆ | ☆ | ☆☆☆ | ☆☆☆ | ☆☆☆☆ | ☆☆☆½ | ★★ |
| **Mitac 4270E** | 708 | ☆☆☆½ | ☆☆☆ | ☆☆☆ | ☆☆☆☆ | ☆☆☆☆ | ☆☆☆☆ | ★★★½ |
| **Reply Model 32 486SX/20** | 709 | ½ | ☆☆½ | ☆☆☆☆ | ☆☆☆ | ☆☆☆☆ | ☆☆☆☆ | ★★½ |
| **Tangent 420S** | 710 | ½ | ☆☆☆☆ | ☆☆☆½ | ☆☆☆½ | ☆☆☆☆ | ☆☆☆ | ★★½ |
| **Tri-Star Flash Cache 486/20sx** | 711 | ☆☆ | ☆☆☆☆ | ☆☆☆½ | ☆☆☆☆ | ☆☆☆☆ | ☆☆☆ | ★★★ |

Overall value is calculated by multiplying each category rating by the category's weight percentage, summing the results, and rounding to the nearest half number.

## WHERE TO BUY

$725, 200MB hard disk $1125; low radiation color VGA display $450
**Reader service no. 803**

**Reply Model 32 486SX/20**
Reply Corp.
4435 Fortran Dr.
San Jose, CA 95134
800/955-5295
LIST PRICE: with 4MB RAM, 1.44MB floppy, three parallel, one mouse, and two serial ports, IDE, VGA, 101-key keyboard $2922; with 120MB hard disk $3572; with 8MB RAM and 200MB hard disk $4274
ACCESSORIES: 2MB RAM $189; 160MB hard disk $1232, 320MB SCSI hard disk $3245; 14-inch 640-by-480 color VGA display $389, 14-inch 1024-by-768 noninterlaced color XGA display $649; DOS 5.0 $102
**Reader service no. 804**

**Tangent 420S**
Tangent Computer
197 Airport Blvd.
Burlingame, CA 94010
800/223-6677
LIST PRICE: with 1MB RAM, 1.2MB floppy, one parallel and two serial ports, IDE, 101-key keyboard $1229; with 4MB RAM and 100MB hard disk, 1024-by-768 noninterlaced color VGA display with adapter, DOS 5.0 $2495; with 8MB RAM, and 200MB hard disk $3095
ACCESSORIES: 1MB RAM $79; second floppy $89; mouse plus Windows 3.0 $89
**Reader service no. 805**

**Tri-Star Flash Cache 486/20sx**
Tri-Star Computer
120 S. Weber Dr.
Chandler, AZ 85226
800/678-2799
LIST PRICE: with 4MB RAM, 1.2MB and 1.44MB floppies, one parallel and two serial ports, 130MB IDE hard disk, 1024-by-768 noninterlaced color VGA display with adapter, 101-key keyboard, mouse, Windows 3.0, DOS 5.0, Windows $2495; with 4MB RAM and 80MB hard disk $2396; with 8MB RAM and 213MB hard disk $2990
ACCESSORIES: 1MB RAM $60
**Reader service no. 806**

# 33-SOMETHING: STILL HOT AFTER ALL THESE YEARS

**Is the fast, reliable 33-MHz 386 still an option? You bet your math chip! At current prices, these amazingly affordable thoroughbreds are your best system buy.**

After weeks of careful research, you've finally decided that the powerful 33-MHz 386 offers the best price/performance value for your business. You're closing in on a vendor and model, and WHAM! Suddenly there's yet another product line based on yet another chip and clock speed.

Does it still make sense to buy a 33-MHz 386? Or should you be looking at a system based on a 20-MHz 486SX, a full-fledged 25-MHz 486, or AMD's 40-MHz 386? Which is faster? How *much* faster? And how do performance gains compare with the higher prices of the faster chips?

For starters we ran nine of the leading 33-MHz 386s through a gamut of business applications—CompuAdd's 333T Low Profile took top honors on both CPU- and disk-intensive tests. Then we ran the same tests on representative systems based on competing processors: a 20-MHz 486SX, a 25-MHz 486DX, and a 40-MHz 386DX. Here's what we discovered.

All else being equal, on CPU-intensive applications like *1-2-3* you can ex-

MICHAEL GOODWIN

## The 33-MHz Alternative

*On the street you can find these speedsters for considerably less than the prices listed here. The bargain-priced CompuAdd 333T Low Profile copped the top spot for its speed on CPU- and disk-intensive applications.*

| Model | List price[1] | Hard disk size | Fast-RAM capacity | Free 32-bit slots | Free 16-bit slots | Free 8-bit slots | Drive bays | Warranty (months) | On-site service |
|---|---|---|---|---|---|---|---|---|---|
| Acer 1100/33 | $4778 | 200MB | 8MB | 6 | 1 | 1 | 5 | 24 | Y |
| CompuAdd 333T Low Profile | $2715 | 120MB | 32MB | 0 | 4 | 1 | 4 | 12 | Y |
| Everex Step 386/33 | $4185 | 105MB | 64MB | 1 | 5 | 1 | 5 | 12 | Y |
| Gateway 2000 33-MHz 386 Cache | $2695 | 200MB | 16MB | 0 | 6 | 0 | 3 | 12 | Y |
| Leading Edge Model D3/33 | $3477 | 130MB | 16MB | 0 | 5 | 1 | 5 | 20[2] | Y[2] |
| Mitac MPC4000G | $3285 | 100MB | 24MB | 1 | 7 | 0 | 6 | 12 | Y |
| Northgate Elegance SP 386/33 | $3299 | 100MB | 32MB[3] | 0 | 6 | 0 | 5 | 12 | Y |
| Tandon 386/33 | $3678 | 110MB | 16MB | 0 | 4 | 1 | 5 | 12 | Y |
| Zeos 386-33 | $2595 | 130MB | 32MB | 0 | 6 | 1 | 7 | 12[4] | Y |

[1]With 4MB RAM, 100 to 200MB hard disk, one or two 1.2MB (or 1.44MB) floppy drives, VGA and VGA color monitor, keyboard, mouse, and DOS 3.31 or later.
[2]Six-month on-site service warranty or 20-month parts-and-labor warranty.
[3]64MB available in tower version.
[4]Includes five-year warranty on the keyboard.

### WHERE TO BUY

**Acer 1100/33**
Acer America Corp.
401 Charcot Ave.
San Jose, CA 95131
408/922-0333,
408/922-0176 (fax)
**Reader service no. 875**

**CompuAdd 333T**
CompuAdd Corp.
12303 Technology Blvd.
Austin, TX 78727
800/333-2429,
512/331-2765 (fax)
**Reader service no. 876**

**Everex Step 386/33**
Everex Systems
48431 Milmont Dr.
Fremont, CA 94538
800/821-0806
**Reader service no. 877**

**Gateway 2000 33-MHz 386 Cache**
Gateway 2000
610 Gateway Dr.
N. Sioux City, SD 57049
800/523-2000
**Reader service no. 878**

**Leading Edge Model D3/33**
Leading Edge Products, Inc.
117 Flanders Rd.
Westborough, MA 01581
508/836-4800,
508/836-4504 (fax)
**Reader service no. 879**

**Mitac MPC4000G**
American Mitac Corp.
410 E. Plumeria Dr.
San Jose, CA 95134
408/432-1160,
408/432-8519 (fax)
**Reader service no. 880**

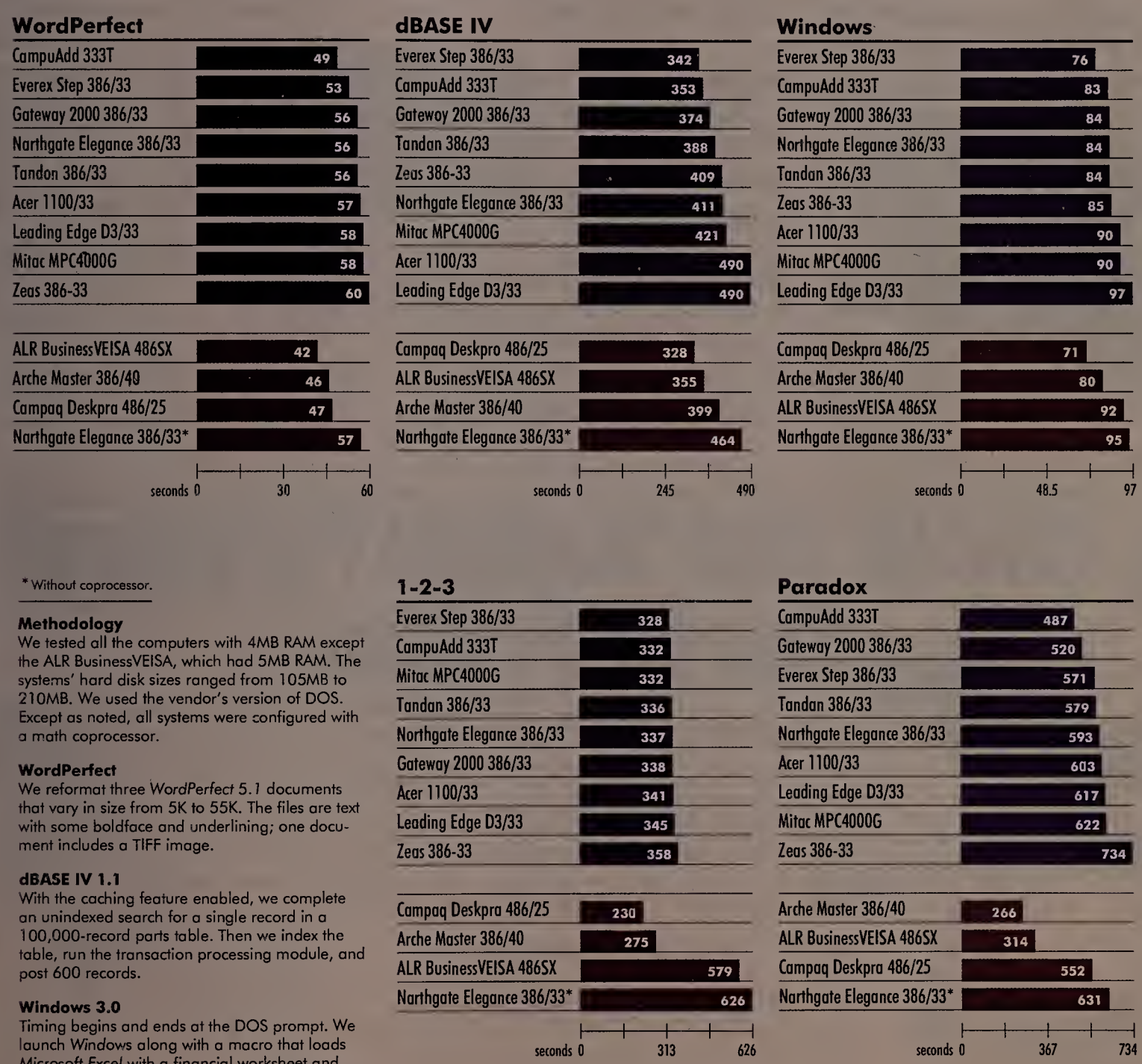
**Northgate Elegance SP 386/33**
Northgate Computer Corp.
7075 Flying Cloud Dr.
Eden Prairie, MN 55344
800/548-1993
**Reader service no. 881**

**Tandon 386/33**
Tandon Corp.
405 Science Dr.
Moorpark, CA 93021
800/800-8850
**Reader service no. 882**

**Zeos 386-33**
Zeos Int'l, Ltd.
530 5th Ave. NW
St. Paul, MN 55112
800/423-5891,
612/633-6131 (fax)
**Reader service no. 883**

# Everex and CompuAdd Are Fleetest 386/33s

*Among these 33-MHz 386 systems (all with math coprocessors installed), CompuAdd and Everex turned in the hottest overall performance figures. To help you judge how these 33s compare with similarly priced platforms based on other 32-bit CPUs, we've also provided (at the bottom of each column) scores for a 486/25; a 386/40; a 486SX; and a 386/33 without a coprocessor.*




* Without coprocessor.

**Methodology**
We tested all the computers with 4MB RAM except the ALR BusinessVEISA, which had 5MB RAM. The systems' hard disk sizes ranged from 105MB to 210MB. We used the vendor's version of DOS. Except as noted, all systems were configured with a math coprocessor.

**WordPerfect**
We reformat three *WordPerfect 5.1* documents that vary in size from 5K to 55K. The files are text with some boldface and underlining; one document includes a TIFF image.

**dBASE IV 1.1**
With the caching feature enabled, we complete an unindexed search for a single record in a 100,000-record parts table. Then we index the table, run the transaction processing module, and post 600 records.

**Windows 3.0**
Timing begins and ends at the DOS prompt. We launch *Windows* along with a macro that loads *Microsoft Excel* with a financial worksheet and initiates a recalc. Then the macro loads Lotus's *Ami Pro* along with a 50K document that contains a 500K TIFF image. Finally, the macro launches *Micrografx Designer*, opens a drawing, displays it on screen, and exits to DOS.

**1-2-3**
We load the application, followed by three separate worksheets (arithmetic, financial, and scientific). We perform various changes and run recalcs on each. Finally, we use the *MAPS* add-in from Management Advisory Services of Seattle to run a number of financial forecasts.

**Paradox**
Starting with an orders table, we compare each record with an available stock table. The application finds the current price for the items and inserts the resulting record into an invoice table.

**Data based on tests designed and conducted by the PC World Test Center. All rights reserved.**

pect the 486DX/25 to come in first, followed closely by the 386/40, and then (a good deal slower, but in a tight finish) the 486SX/20 and the 386DX/33. (If the 386/33 has a coprocessor, it will probably edge past the 486SX on this math-intensive benchmark; otherwise the 486SX usually sneaks into the lead.)

For instance, it took Compaq's 486/25 3 minutes and 50 seconds to complete the *1-2-3* benchmark. Arche's 386/40 (with a coprocessor) was nearly as fast at 4 minutes and 35 seconds. ALR's BusinessVEISA (the quickest 486SX we tested, without a coprocessor) took almost 10 minutes, while Northgate's 386/33 (also tested without a coprocessor) finished last at 10 minutes, 26 seconds.

The rankings are the same for disk-intensive applications such as *dBASE*, but because a math coprocessor has no effect on these applications the scores are a lot closer. Once again, the top winners were Compaq's 486/25 (which completed the *dBASE* test in 5 minutes, 28 seconds) and Arche's 386/40 (roughly a minute slower). But this time ALR's BusinessVEISA 486SX stayed close, coming in at a hair under 7 minutes. Northgate's 386/33 finished last at slightly under 8 minutes. *Windows* tests showed a similar pattern, but oddly enough ALR's 486SX aced the *WordPerfect* benchmark, taking first place over the 486/25 and 386/40.

### Paying the Cost to Be the Boss

So much for raw power—how about price? As you might expect, a high-performance 486DX/25 will cost a good deal more than any of the other models. After that, price, speed, and expectation diverge. Theoretically, a 20-MHz 486SX machine should be cheaper than its 33-MHz 386 counterpart because the 486SX processor costs only a bit more and the 20-MHz machine can use slower support chips. Theory, however, doesn't always conform to practice: Most companies that make both machines list the 386/33 for $100 to $500 *less* than the 486SX.

To make matters more confusing, you probably can get a 386/40, which runs almost as fast as a 486/25, for a *lot* less than a 486SX.

Calculating price-performance ratings is not a trivial task—especially with prices so volatile. As 486-based machines become more popular, prices for 386-based systems will continue to drop. But it's only a matter of time before 486SX system prices follow suit. If you can afford to be patient, buying a 486SX could be a smart move. If you're buying now, these fast, surprisingly affordable 386/33s are a bargain hunter's delight.

*Michael Goodwin is an associate editor for* PC World.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***...or your simplest! Master Switch, the intelligent data switch from Rose Electronics, can handle it. The Master Switch series is so versatile and sophisticated, peripheral sharing becomes easy.***

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**Circle 239 on reader service card**

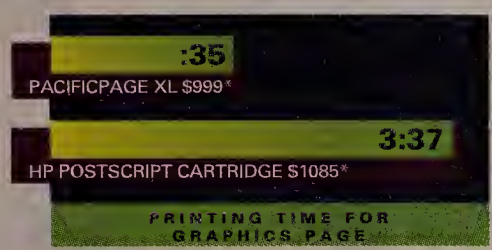
# PC Magazine caught us speeding.

## *"PacificPage XL beats HP on LaserJet PostScript printing"*

PC Magazine, June 25, 1991

### FASTEST PRINTING SPEED. LOWEST PRICE.

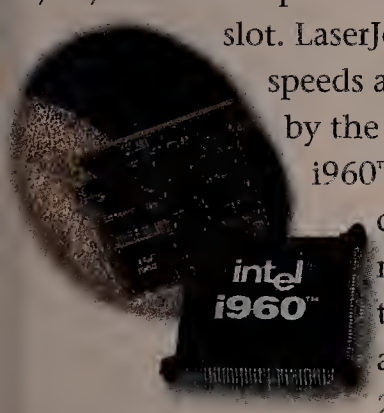
PacificPage XL is fast. So fast, that PC Magazine has cited it for exceeding the speed limit of Hewlett-Packard's PostScript® Cartridge by more than six times.




*"PacificPage XL provides the fastest PostScript printing available on a desktop."*

If by chance the speed doesn't sell you, the low price will. Because it's the one feature of PacificPage XL that doesn't exceed HP's cartridge.*

How do we get it to work so fast? It's really quite simple. We've taken our award-winning PostScript language emulation cartridge called PacificPage P•E, and combined it with a high speed accelerator board that installs easily into your LaserJet IIP, III, IIID or IIIP printer memory slot. LaserJet printing speeds are boosted by the fast Intel i960™ RISC processor that's mounted on the board alongside 2 MB of printer memory.




*"An Intel i960 RISC processor on the accelerator board helps the PacificPage XL print graphics more than six times as fast as the HP PostScript Cartridge."*

Do you use a shared printer? If you do, you'll definitely want the speed of PacificPage XL. Because output is printed so fast, other users won't have to wait for their jobs to print.

Make a quick price/performance comparison and you'll see — PacificPage XL is the smart choice!

### 35 POSTSCRIPT COMPATIBLE FONTS

Acquiring stylish, professional looking output is easy with PacificPage XL. Because we've included 35 fully scalable Apple LaserWriter equivalent fonts. These high quality Bitstream designs provide you with the tools you need to create output that shines. For even greater versatility, PacificPage XL supports Bitstream's Speedo fonts and Adobe Type 1 and 3 fonts.

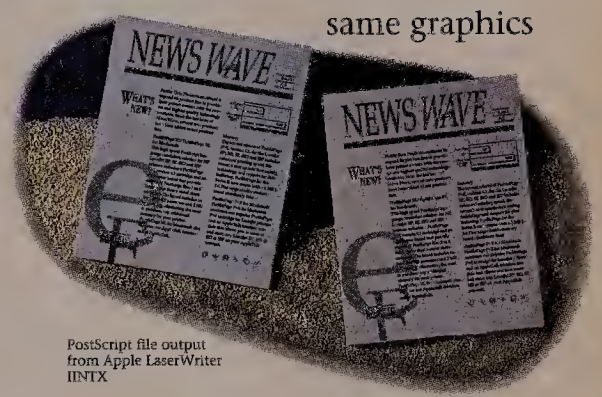
COURIER
SWISS
SWISS NARROW
DUTCH
ZAPF CALLIGRAPHIC
GEOMETRIC
REVIVAL
CENTURY
*CHANCERY*
Zapf Dingbats
✶✲❹✂✔★✤❷✧
Symbol
↔Δ•ΦΓ∝ϒNX≠

Each typestyle comes in normal, bold, italic and bold italic treatments except for Chancery, Zapf Dingbats, and Symbol.

*"The native 35 PostScript compatible fonts in PacificPage XL are Bitstream designs, some of them superior to Adobe's version."*

### 100% POSTSCRIPT LANGUAGE COMPATIBILITY — GUARANTEED

Many LaserJet users believe that only true Adobe PostScript gives true PostScript capabilities. The truth is, PacificPage XL provides exactly the same graphics capabilities for your LaserJet as Adobe PostScript. Exactly. So you can pay less and, in addition to speed, get all of PostScript's powerful graphics functions. We're so sure of it that we give you our money back guarantee of satisfaction.




PostScript file output from Apple LaserWriter IINTX

PostScript file output from LaserJet III with PacificPage XL

*"PacificPage XL swiftly and accurately renders some test EPS files that other interpreters distort and had no trouble with any of the large and complex images used for testing."*

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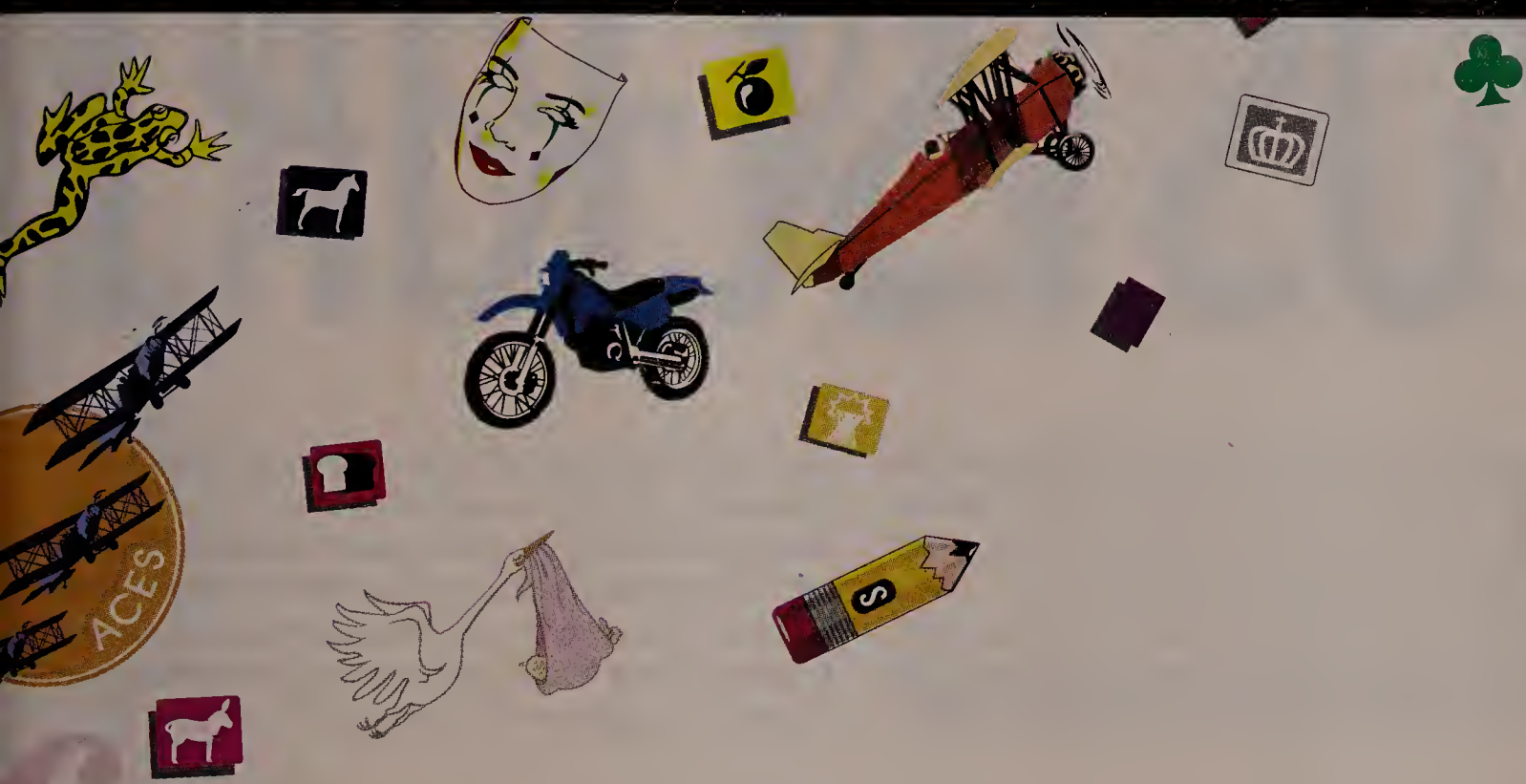


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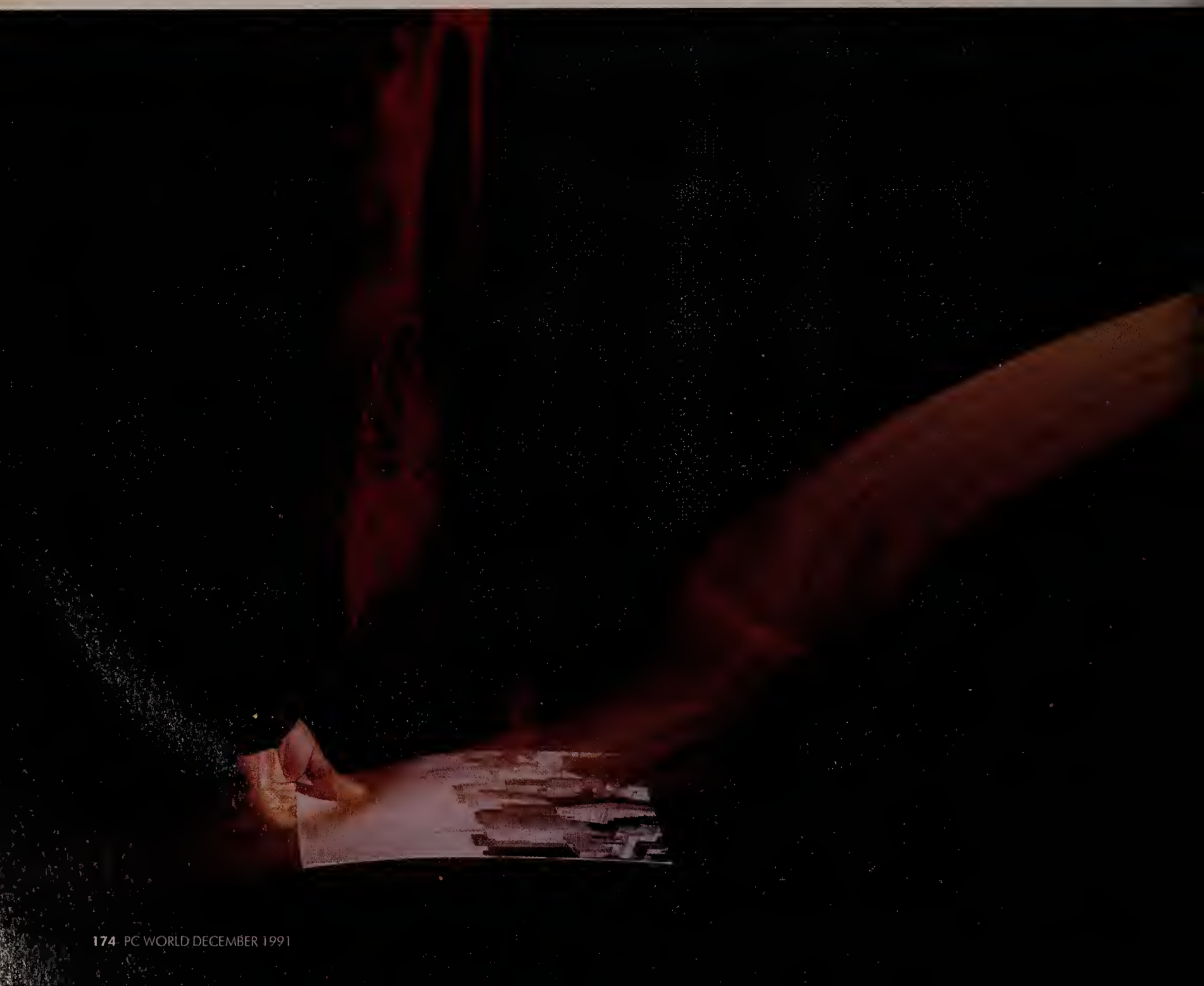
**Circle 179 on reader service card**

# POSTSCRIPT

When it comes to producing dazzling text and graphics, there's no contest: A PostScript printer blows the LaserJet away. Don't believe it? Let's look at the facts.

Most PostScript printers come with 35 or more scalable fonts; unless you take on the expense and confusion of adding font options, the LaserJet III comes with eight. Thanks to its sophisticated page description language, a PostScript printer can produce graphics the LaserJet can only dream about—such as high-quality Encapsulated PostScript (EPS) clip art. And if you need to design professionally typeset materials, only a PostScript device lets you see what your final output will look like *before* you send it to the typesetter.



# LASERS

## Want to avoid font confusion and still look your best? Today's PostScript printers give you sharp fonts and sleek graphics for under $2600.

Of course, you may not need all that printing power. If all you do is crank out simple correspondence or spreadsheets, save yourself some money and buy a $1000 LaserJet clone. But if you want to use eye-catching fonts in presentation overheads or add complex illustrations to a report, PostScript is the way to go.

For individual users or small work groups, a low-cost PostScript printer is a perfect fit. (If you need to serve a big network, you should consider more expensive models offering heftier paper handling, font storage, and durability.) We looked at nine units with street prices running under $2600 in our test configuration. All are 300-dpi devices, and are

BOB WEIBEL AND DANIEL TYNAN

PHOTOGRAPHS BY LUIS DELGADO

equipped with at least 35 scalable typefaces, built-in PostScript (or compatible) interpreters, and enough RAM (4MB) to handle a passel of downloadable fonts. Print engines range from a lightweight 4 pages per minute (ppm) to a brawny 11 ppm, but the speed of PostScript printers generally depends more on the brain than on the brawn—the fastest performers are all built around high-speed RISC processors.

In evaluating these units, print quality was of prime importance, followed by speed and price. Paper handling, fonts, and emulations also played a big role, as did service and support policies and ease of use (see "Buying Smart"). One clear winner stood out: The Best Buy Epson EPL-7500 delivered superb print quality and speed.

More sweet deals are on the way (see the sidebar "PostScript Printers: Best of the Rest"). If you've been thinking about purchasing a PostScript printer but have been put off by high prices, now is an opportune time to buy.

*Bob Weibel is a freelance writer in Ashland, Oregon. Daniel Tynan is an associate editor for PC World.*

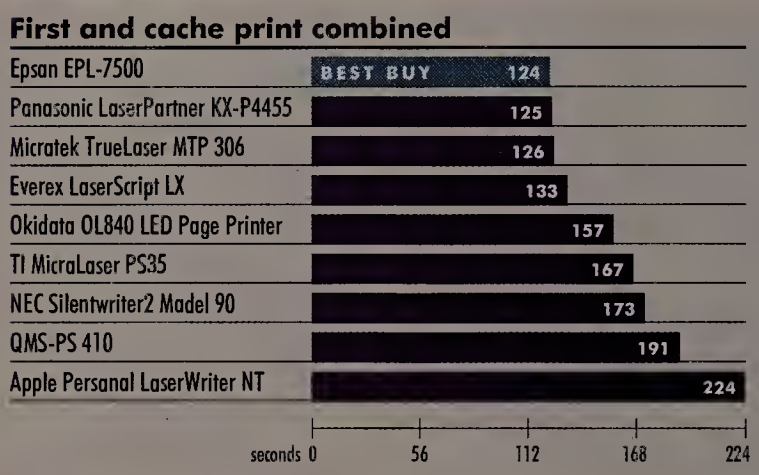
**PC WORLD** TEST REPORT

## Clear Leaders of the PostScript Pack

*Epson's EPL-7500 and Microtek's TrueLaser give you the speed you need for printing complex text and graphics, thanks to their powerful RISC processors.*

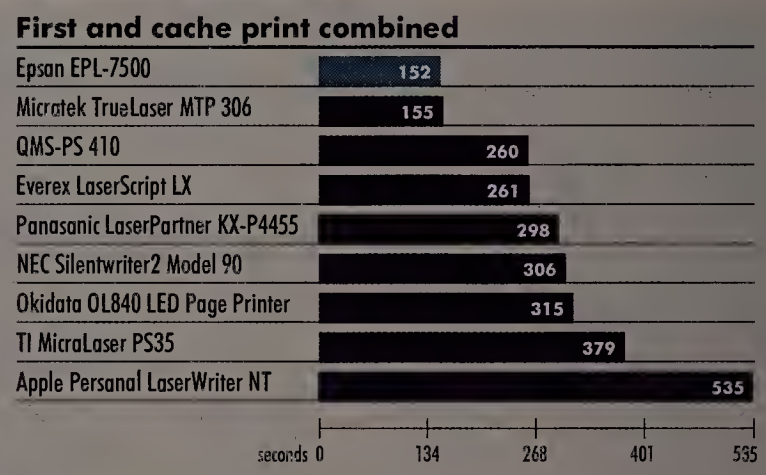
### WordPerfect

**First and cache print combined**



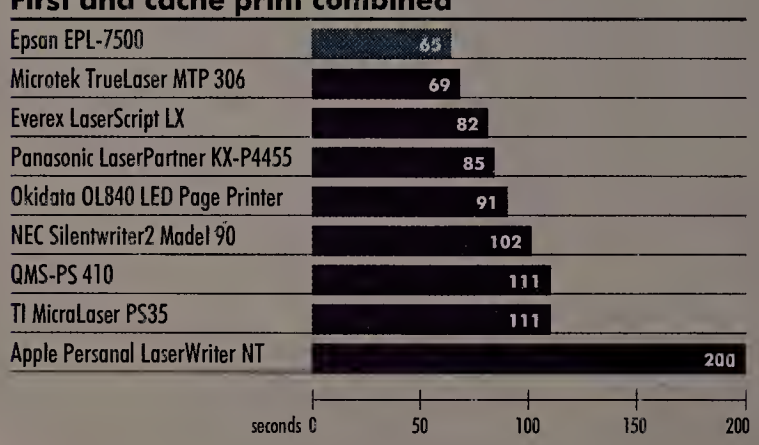

### Ventura Publisher

**First and cache print combined**



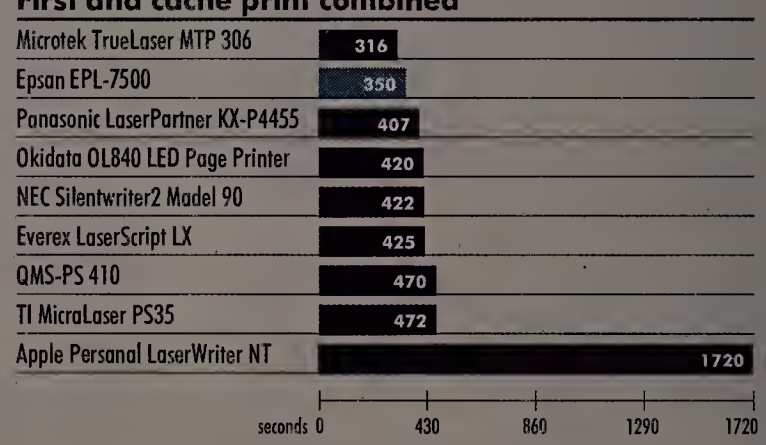

### 1-2-3

**First and cache print combined**




### PageMaker

**First and cache print combined**




**Methodology**
We printed four copies of each test file. The times shown are the sum of the initial print time plus the average time of the subsequent three printouts.

**WordPerfect**
We print a four-page text document with two columns, several different fonts, and headers and footers. The *WordPerfect* file does not contain any graphics.

**1-2-3**
We print a single page using *Allways*. The page consists of a half-page spreadsheet and a half-page bar chart. The file also contains several fonts.

**Ventura Publisher**
The *Ventura Publisher* file is produced with the *GEM* version. The file is a single-page flier with several line-art graphics. We use four fonts and three paragraphs of text.

**PageMaker**
*PageMaker* is the only *Windows* application used. Our file is a two-page newsletter that contains a variety of fonts, two-column text, and TIFF images.

**Data based on tests designed and conducted by the PC World Test Center. All rights reserved.**

## Apple Personal LaserWriter NT

**PROS:** Low price, compact footprint, easy maintenance

**CONS:** Very slaw, no parallel port or front panel contrals

The Personal NT is a printer for the Macintosh, not for PCs. The $2043 price is seductive, but low speed and the lack of panel controls make the NT impractical for PC users unless they're sharing it with Macs.

The NT lacks a parallel port, and printing via the serial connection is a lesson in patience: The 4-ppm NT finished dead last in our tests. Manually boosting data transfer rates—or installing a LocalTalk board—can double print speed, but the printer will never be fast.

The NT's lack of front panel controls is fine for Macs, which provide printer control from the keyboard via an AppleTalk link, but not for PCs. To switch ports or emulations, you must power down the unit and flick a rear switch. And there's no LCD readout; small lights tell you if the printer is processing, out of paper, or jammed. The NT produces good-looking output, but other printers do it faster with less.

**Apple delivers a surprisingly affordable entry, but it's slow and lacks the panel controls that PC users need.**

**The Epson EPL-7500's stunning print quality and zippy performance add up to this roundup's only Best Buy.**

## Epson EPL-7500

**PROS:** Excellent print quality, fast, convenient maintenance, twa-year warranty

**CONS:** Limited HP fonts, relatively expensive

If top print quality is a must, the EPL-7500 will deliver—black areas print rich and smooth, and text is as crisp as a new $100 bill. Fast and easy to use, this $2472 Best Buy is perfect for high-quality reports, overheads, and handouts A virtuoso of versatility, the EPL-7500 can handle any job.

The EPL-7500's RISC-based controller blazed through the speed tests, finishing neck and neck with the Microtek. Paper handling and ergonomics are superb—the printer holds a generous 250 sheets, and you can add a second 250-sheet tray for $275. The EPL-7500 doesn't support font cartridges, but its liberal 6MB RAM capacity means you'll have plenty of room to download typefaces. Epson's toll-free support is prompt and knowledgeable, and the two-year warranty is tops.

If speed and output quality are key, the EPL-7500 is the one.

## Everex LaserScript LX

**PROS:** Inexpensive, well-designed front panel, 90 days free an-site service

**CONS:** Subpar graphics, emulation switching errors

If you want a PostScript bargain and don't print halftones or small type, the $1687 LaserScript LX is tempting. Able to switch automatically between its four active ports, this printer is well suited for print sharing among Macs and PCs. The well-designed front panel LCD shows the status of all four ports and the emulation each port is using.

The LX's auto-emulation switching has an annoying habit of flipping from PostScript to HP, and memory for spooling print jobs is on the low side. Print quality is unspectacular: Black-and-white blends and patterns are fine, but gray-scale halftones are murky, and fonts below 12 points show slight aberrations.

The 6-ppm LX is relatively fast and comes with good support, including 90 days of free on-site service. If price is more important than top-notch graphics, the LX is a good choice.

**Cutting costs, but still need to look good? This $1687 Everex LaserScript LX is as cheap as PostScript gets.**

## Microtek TrueLaser MTP 306

**PROS:** Very fast, 60-days on-site service, supports LaserJet font cartridges

**CONS:** Rudimentary front panel menu, slow serial port

Like the Epson, the TrueLaser's RISC processor can keep a hectic pace. The printer's limited 150-sheet capacity limits its appeal to work groups, and its mediocre graphics quality will keep it off the desks of serious desktop publishers, but it's hard to say no to this speed demon

The Microsoft-engineered PostScript interpreter does well on most print jobs, though like the LaserScript, halftones tend to be muddy and text quality diminishes at small sizes. You can't assign different emulations to the serial and parallel ports, making the printer less flexible for work groups. The serial port's maximum data transfer rate is half that of the QMS-PS 410 or the LaserScript, a potential bottleneck when hooking up multiple PCs.

If speed is your main concern, these shortcomings are relatively minor trade-offs. The TrueLaser is a good value for individual users.

**If you need it ASAP, Microtek's speedy TrueLaser is the answer, but graphics quality needs improvement.**

**NEC's Silentwriter2 wins second-place honors with its superb print quality and low-cost operation.**

## NEC Silentwriter2 Model 90

**PROS:** Excellent print quality, low price, convenient paper handling

**CONS:** Average printing speed

You'd need a magnifying glass and a bad attitude to notice any difference in print quality between NEC's Silentwriter2 and the top-rated EPL-7500. And at $2100, NEC's 6-ppm Model 90 is more than $300 cheaper on the street. If only it were faster, the Silentwriter2 would have earned its own Best Buy.

Paper handling is very convenient. The Silentwriter2 sports a unique letter/legal paper selection button on the front panel. It's the perfect accompaniment to the Silentwriter2's adjustable paper tray. Though other printers offer adjustable trays, like the Best Buy EPL-7500, the NEC lets you load the 250-sheet tray without removing it. At 2.5 cents per page, it's also the most economical.

The Silentwriter2 delivers hot output at a good price. If you're willing to wait a little longer for your print jobs, NEC has your printer.

## Okidata OL840 LED Page Printer

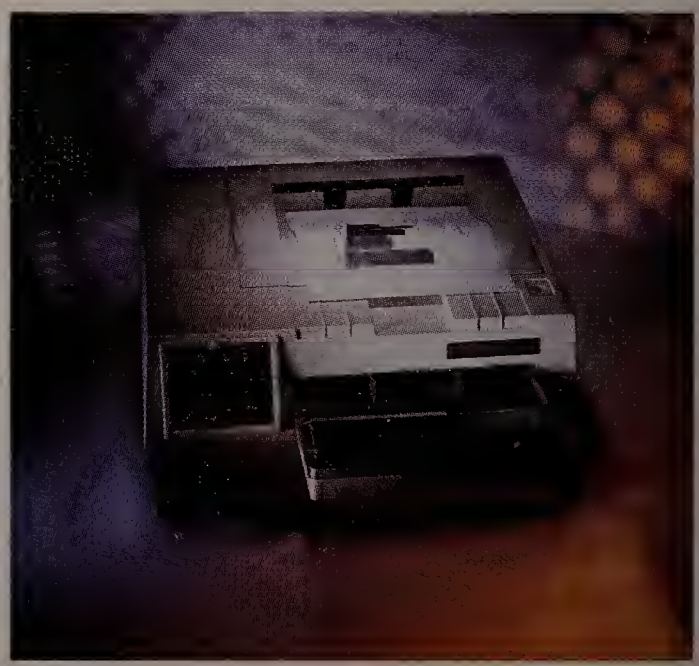
**PROS:** Sharp text, multiple font options

**CONS:** No toner density control, poor direct phone support

The $2267 OL840 has capable font and paper options and sharp-looking text, but graphics quality is subpar. Black fills are dark and solid, but halftones and gray shades have vertical streaking, and you can't control toner density—a bad combination if you plan to print a lot of graphics. The logical conclusion: The Okidata's a good choice for text jobs.

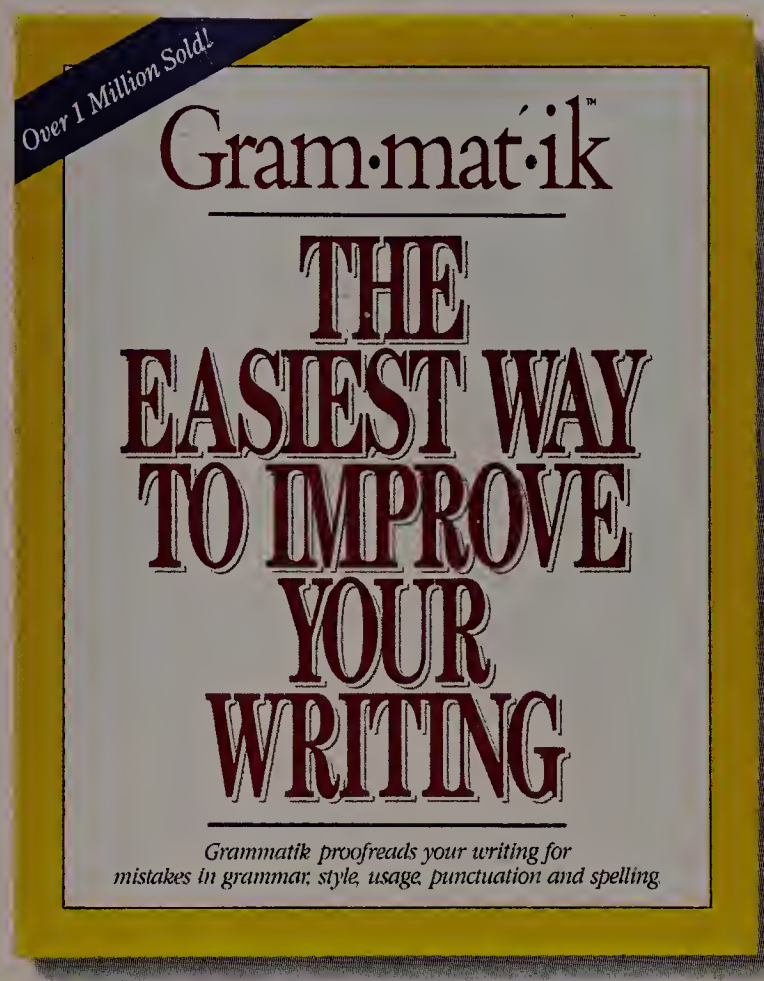
The OL840 excels at font options—it offers the equivalent of eight HP and three PostScript cartridges. You can also add a second 200-sheet paper bin ($229), giving you an office-worthy printer for hundreds less than the Panasonic KX-P4455.

Okidata's phone support was poor We placed a dozen calls over three weeks and never reached a technician. (At press time, Okidata announced that TRW would be its third-party service provider.) Still, if you want lots of fonts, the OL840 makes sense.



**Born to churn out text, Okidata's OL840 offers a plethora of fonts along with crisp text output.**

# Grammar

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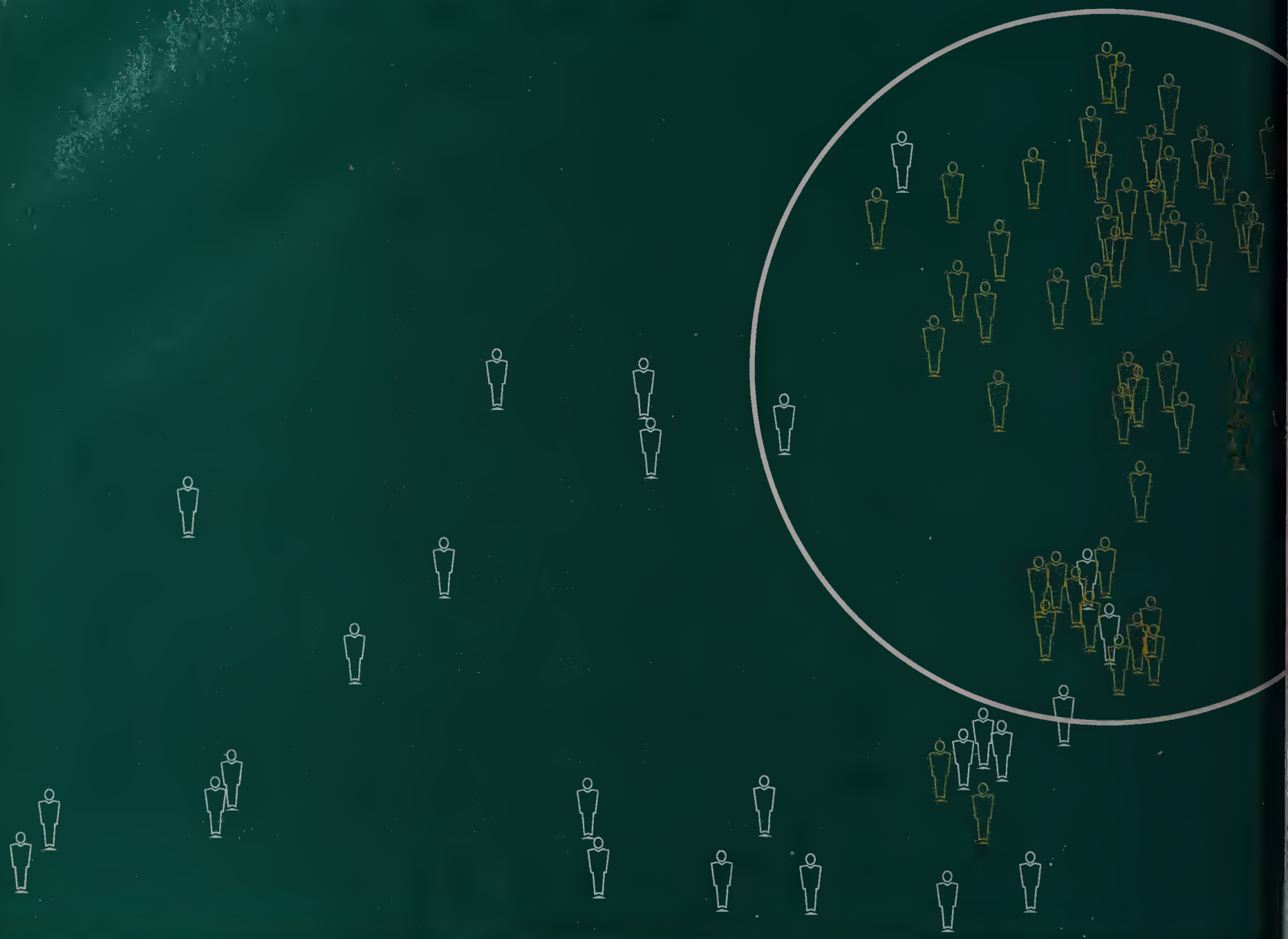

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# Buying Smart: PostScript Printers on the Cheap

You want sharp-looking output, you want it fast, and you want it cheap. PostScript shoppers should also consider paper handling, font options, service and support policies, and the ease of changing printer settings and replacing consumables.

### OUTPUT QUALITY

All the printers reviewed here churn out readable text at 12 points and up, but the top ones produce sharp text at all sizes. If you regularly use small fonts or magnify output via an overhead projector, you'll want that finer detail. When gauging graphics quality, look for dense, evenly filled black and gray areas and smooth gradations with minimal loss of detail when printing continuous-tone images (halftones).

### SPEED

Processing power, not the print engine, is the key to fast PostScript printing. Creating fonts and graphics involves heavy number crunching—and that's where high-speed RISC processors excel. Faster print engines do best when printing long text documents or multiple copies of pages whose fonts have already been processed. The *WordPerfect* test is probably your best gauge of text-printing performance. To check how a printer handles business graphics, look to the *1-2-3* test, and the *Ventura* benchmarks may give you an idea of line-art performance. If scanned halftones are finding their way into your documents, note the *PageMaker* scores.

### PRICE

You don't need a brother-in-law in the printer business to get a good deal. Considering that many PostScript printers cost $4000 to $6000, we gave almost all these personal PostScripts three and a half or four stars.

We called dealers all over the country to get printer street prices (including 4MB RAM and a legal-size paper tray if available), then averaged the results. Before you buy, figure in the cost of the RAM, fonts, and paper handling options you'll need. Also consider the cost of consumables; an extra penny a page can make a big difference over the life of a printer.

### PAPER HANDLING

Don't you hate sending a rush job to the printer only to find that it's out of paper? Large (200- to 250-sheet) paper trays help you avoid that headache, and dual bins are even better, especially if you regularly use different paper stocks or sizes. Some printers have adjustable trays that accommodate letter, legal, and other size paper and envelopes.

### FONTS AND EMULATIONS

Because each printer comes with at least 35 standard fonts—plenty for most business applications—they all receive at least a three-star rating. But if you produce presentation overheads or newsletters, you may want the additional scalable fonts that some units deliver. If you need to download soft fonts, you'll want at least 4MB of RAM to hold them. Look for the ability to add PostScript and LaserJet-compatible font cartridges—especially if you plan to print in both HP and PostScript modes, since all downloaded fonts are erased automatically when you switch emulations.

If you use an old application that doesn't support PostScript, or if some of your staff will remain standardized on the LaserJet, you'll want a printer that switches easily between the two emulations. The top models read the incoming print job and switch modes automatically; others make you issue software commands or toggle front panel controls.

### EASE OF USE

The friendliest printers come with logical front-panel controls and an LCD readout that tells you paper and toner levels, emulation modes, and error messages. You'll also want an integrated toner/ drum/ developer unit—separate consumables can be messy and prone to damage from exposure to light.

If your work group isn't networked but you want to share a printer, you may want the convenience of a printer that lets you attach multiple PCs to its ports, and switches automatically between them. This is especially useful if you need to hook up Macs as well as PCs, but it's not essential—an inexpensive printer-sharing device can also do the job.

### SERVICE AND SUPPORT

When you get stuck, there's no substitute for good service and support. Look for a warranty of a year or more and on-site service. Sometimes a simple word of advice will do the trick—to gauge technical support, we called each vendor at least three times, asking questions of varying technical complexity and noted the timeliness and accuracy of each response. We also factored in support hours, toll-free lines, and BBS and fax support.

## Panasonic LaserPartner KX-P4455

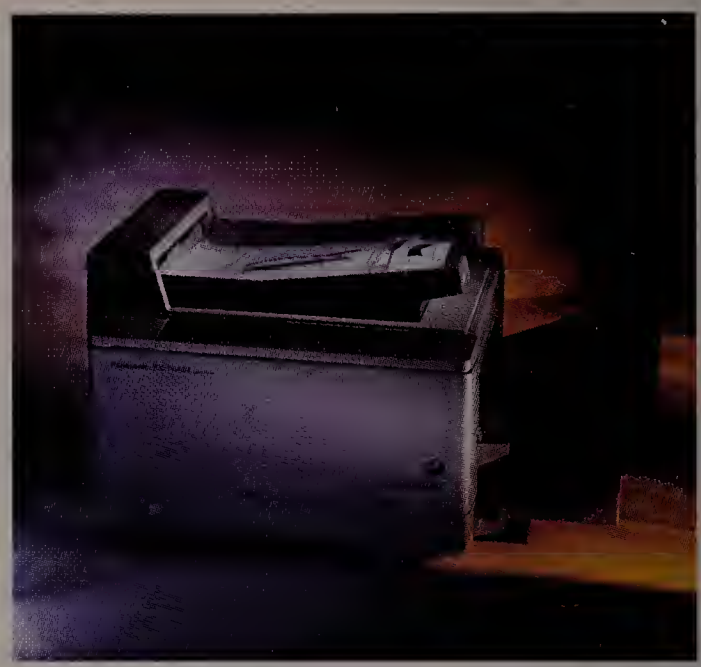
**PROS:** Dual paper bins, extra scalable fonts

**CONS:** Messy toner replacement

With its 11-ppm engine, high 500-sheet paper capacity, and hefty duty cycle, the $2534 Panasonic LaserPartner KX-P4455 attempts to be a PostScript printer that can handle the workload of an entire office.

The KX-P4455 has trouble producing dense blacks, but halftones and screens look smooth, and text is good. Its software-accessible HP emulation comes with 26 fonts, and you get 39 PostScript fonts. Two 250-sheet input bins and a 20,000-page monthly duty cycle qualify the 67-pound LaserPartner as an office workhorse. But replenishing toner through a separate squeeze bottle is potentially messy and makes the printer difficult to maintain.

All in all, the Panasonic LaserPartner is a good deal for busy offices that are looking to crank out HP text documents with some occasional PostScript output.



**The powerhouse Panasonic LaserPartner KX-P4455 pumps out text documents but hits the wall when printing graphics.**

**The QMS-PS 410 is first at fonts but among the last at speed. Have patience and enjoy the results.**

## QMS-PS 410

**PROS:** Extra built-in fonts, compact footprint, automatic port and emulation switching

**CONS:** Fairly slow, minimal front panel controls, small paper input tray

The QMS-PS 410 is a handsome little printer that gives you a truckload of extra fonts to play with—your $2226 buys 45 built-in PostScript fonts plus support for additional font cartridges. With its automatic port and emulation switching, it's an especially good choice if you want to share your printer without investing in a network. Not only is the price right, maintenance costs a low 27 cents per page.

The 4-ppm unit was fairly lethargic, finishing in the middle of the pack. The PS 410 is not the friendliest printer to operate—it offers ten front panel indicator lights but no LCD display or menu. There's no way to tell which port or emulation is active when a job is printing, and reconfiguring the unit requires a software utility.

If you need extra built-in fonts for your presentations and other high-visibility documents, the QMS-PS 410 is a good pick.

## Texas Instruments MicroLaser PS35

**PROS:** Good font support, small footprint, large paper capacity

**CONS:** Fairly slow, hard-to-replace consumables

The TI MicroLaser PS35 is the most compact printer in the roundup, and you get generous font support. What you sacrifice is speed: The 6-ppm PS35 was one of the slowest in the bunch. (At press time, TI announced it was replacing this printer with a similarly priced 9-ppm version as well as introducing a RISC-based model for $2249.)

Type quality is good; blacks are fairly dark but suffer slightly from banding. Though the PS35 lacks automatic port switching, you can save multiple port and emulation configurations and then quickly invoke them from the front panel menu. The 250-sheet paper tray is another plus for a printer this small, and you can add a second bin for $395, but you'll have to hassle with separate toner, drum, and developer units.

If you're short on space and don't require speedy output, the $2196 MicroLaser is a steal.

**The best little workhorse in Texas: TI's MicroLaser PS35 has huge paper capacity for its size, but it's no barn burner.**

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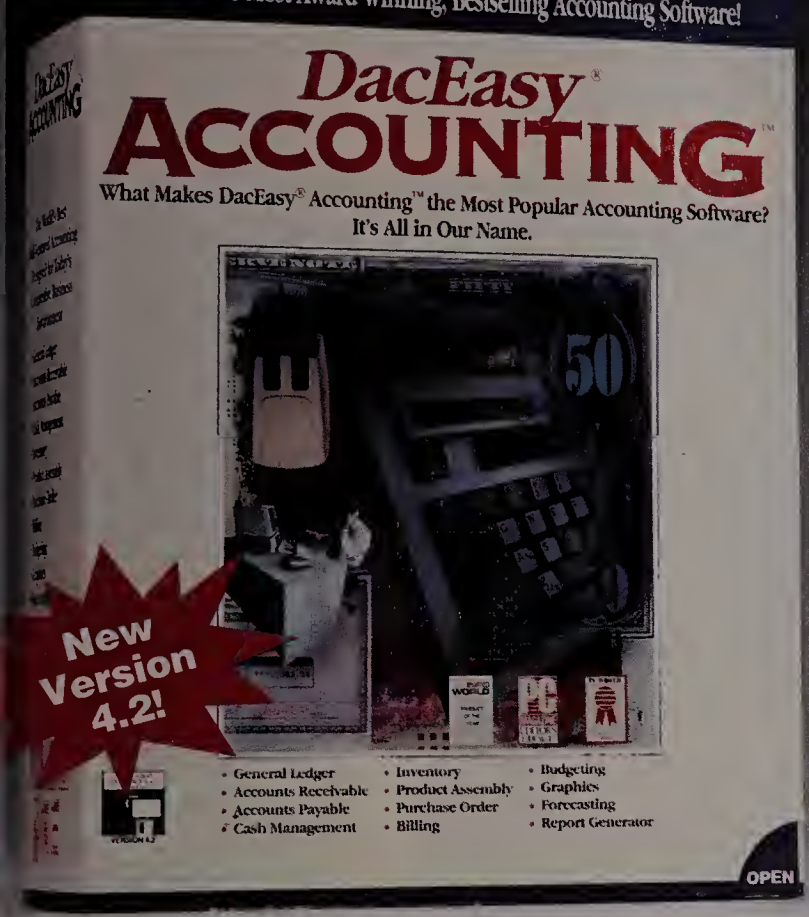


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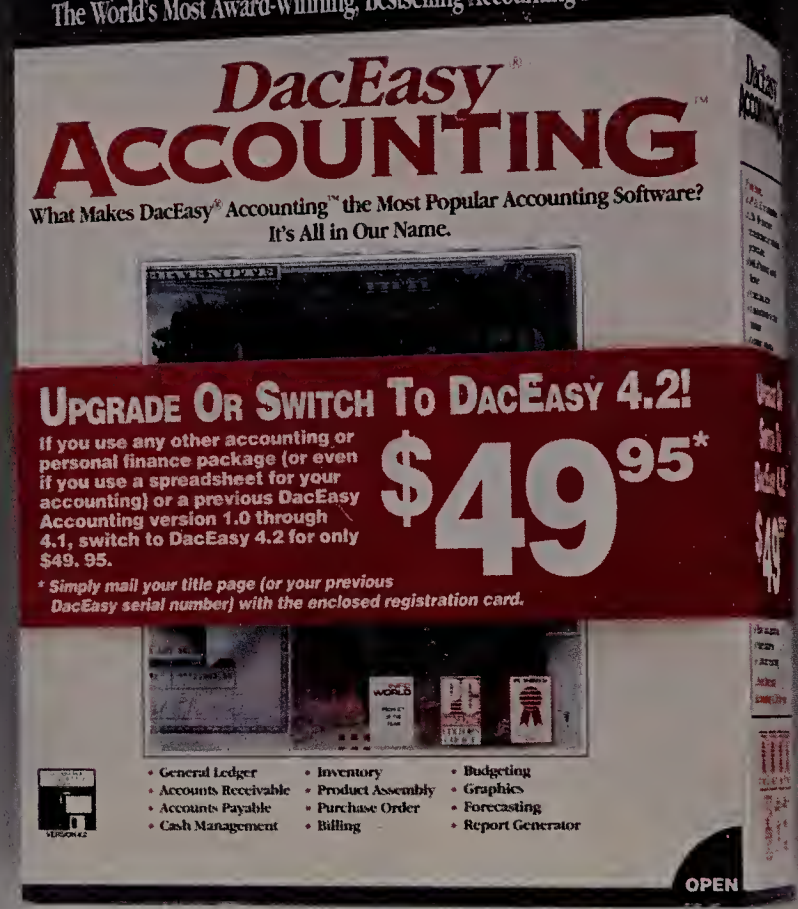


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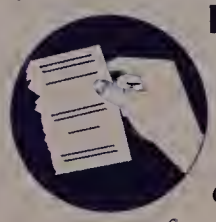

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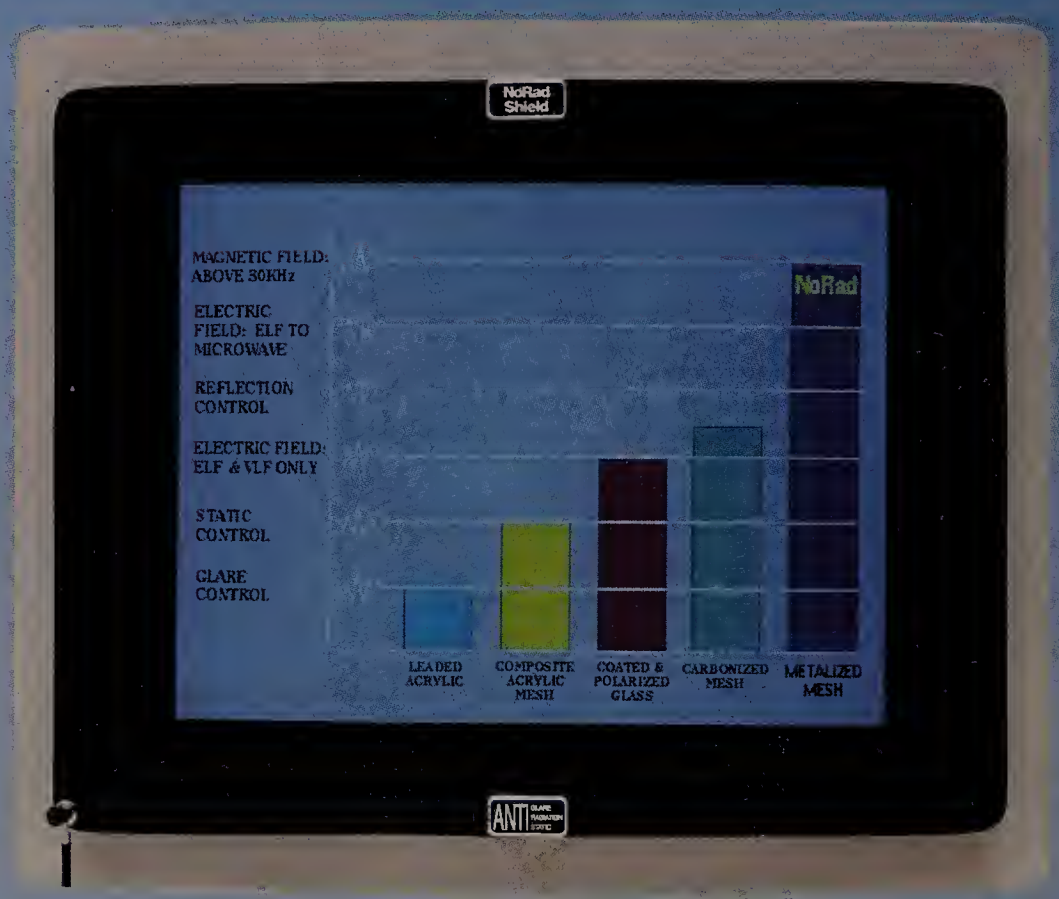


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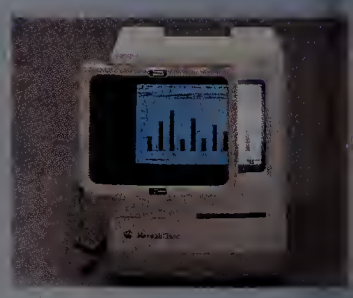
Some screens reduce glare, but actually increase reflections because they're made of polished glass. The NoRad Shield's high-resolution screen tackles these two problems handily and also eliminates the static field which attracts dust to your monitor and propels dust to your skin and eyes.

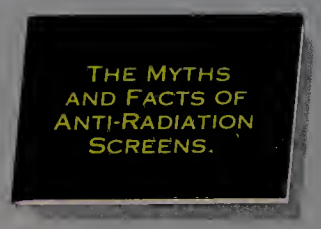
Why buy a screen that only does a fraction of what you need, when one does it all? **NoRad.**

*The **NoRad Shield** is available in several models to fit virtually all IBM® PCs and compatibles, terminals and large format displays.*



*The **NoRad Shield** fits Apple® and Macinto displays, and is available in a platinum-colored frame for the SE and the Classic*

*Call now to learn more about the* **NoRad Shield** *and receive your* MYTHS AND FACTS OF ANTI-RADIATION SCREENS *bookle*




**1-800-262-3260**

**NoRad**

NoRad Corporation 1549 11th Street Santa Monica, CA 90401
(213) 395-0800 FAX: (213) 458-6397

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**Circle 180 on reader service card**

FEATURES EVALUATION

# Positive PostScript Vibrations

*Output quality and speed are your key PostScript buying issues—and the Best Buy Epson EPL-7500 delivers on both counts with a small-footprint machine that's a breeze to set up.*

● Yes
○ No
◒ Deficient

| | Apple Personal LaserWriter NT | Epson EPL-7500 | Everex LaserScript LX | Microtek TrueLaser MTP 306 | NEC Silentwriter2 Model 90 | Okidata OL840 LED Page Printer | Panasonic LaserPartner KX-P4455 | QMS-PS 410 | Texas Instruments MicroLaser PS35 |
|---|---|---|---|---|---|---|---|---|---|
| **Standard features** | | | | | | | | | |
| Street price[1] | $2043[2] | $2472[3] | $1687[4] | n/a[5] | $2100 | $2267 | $2534 | $2226 | $2196 |
| List price[1] | $2678 | $2999[3] | $2195[4] | $1995[6] | $2994 | $3087 | $3743 | $3294 | $2282 |
| Rated engine speed (ppm) | 4 | 6 | 6 | 6 | 6 | 8 | 11 | 4 | 6 |
| RISC processor | ○ | ● | ○ | ● | ○ | ○ | ○ | ○ | ○ |
| Duty cycle (pages per month) | n/a[7] | 3000 | 3000 | 3000 | 6000 | 5000 | 20,000 | 6000 | 3000 |
| Engine life (pages) | 150,000 | 180,000 | 300,000 | 300,000 | 180,000 | 300,000 | 300,000 | 360,000 | n/a[7] |
| Estimated cost per page (cents)[8] | 2.7 | 2.9 | 4.1 | 3.1 | 2.5 | 3.2 | 3 | 2.7 | 2.7 |
| **Paper handling** | | | | | | | | | |
| Standard/maximum capacity | 250/250 | 250/500 | 150/150 | 150/150 | 250/250 | 200/400 | 500/500 | 50/300 | 250/500 |
| Dual bins | ○ | ●[9] | ○ | ○ | ○ | ●[9] | ● | ●[9] | ●[9] |
| Adjustable trays | ○ | ● | ● | ● | ● | ○ | ○ | ● | ○ |
| Legal-size paper | ●[9] | ● | ● | ● | ● | ●[9] | ●[9] | ● | ●[9] |
| Envelopes | ●[9] | ● | ● | ● | ● | ●[9] | ●[9] | ●[9] | ●[9] |
| **Fonts and emulations** | | | | | | | | | |
| Standard scalable typefaces | 35 | 35 | 35 | 35 | 35 | 35 | 39 | 45 | 35 |
| Standard LaserJet fonts | 26[10] | 3 | 24 | 13 | 13 | 26 | 26 | 24[10] | 13 |
| Accepts Type 1 downloadable fonts | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Accepts PostScript font cartridges | ○ | ● | ○ | ○ | ○ | ● | ○ | ● | ● |
| Accepts LaserJet font cartridges | ○ | ● | ● | ● | ○ | ● | ○ | ● | ● |
| Automatic emulation switching | ○ | ◒[11] | ● | ○ | ◒[11] | ◒[11] | ◒[11] | ● | ○ |
| Standard/maximum RAM (MB) | 2/8 | 2/6 | 2.5/4.5 | 2/4 | 2/4 | 2/4 | 2/4 | 2/4 | 1.5/4.5 |
| **Ease of use** | | | | | | | | | |
| Front-panel controls | ○ | ● | ● | ● | ● | ● | ● | ● | ● |
| Front-panel LCD | ○ | ● | ● | ● | ● | ● | ● | ○ | ● |
| Integrated toner/drum/developer | ● | ● | ● | ○ | ● | ● | ○ | ● | ○ |
| Automatic port switching | ○ | ● | ● | ● | ○ | ○ | ○ | ● | ○ |
| Separately configurable ports | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| Parallel port | ○ | ● | ● | ● | ● | ● | ● | ● | ● |
| Serial port | ● | ● | ●[12] | ● | ● | ● | ● | ● | ● |
| LocalTalk port | ● | ● | ● | ● | ● | ● | ● | ● | ●[9] |
| **Service and support** | | | | | | | | | |
| Warranty (years) | 1 | 2 | 1 | 1 | 1 | 1[13] | 1 | 1 | 1 |
| Toll-free tech support | ◒[14] | ● | ○ | ○ | ○ | ● | ● | ○ | ○ |
| Daily support hours | 11 | 10 | 12 | 10 | 11.5 | 9 | 9 | 9 | 9 |
| On-site service | ◒[15] | ● | ● | ● | ○ | ●[9] | ○ | ○ | ○ |
| BBS/fax support | ○ | ● | ● | ● | ● | ● | ○ | ● | ● |
| | | BEST BUY | | | | | | | |

[1] Price based on 4MB RAM and legal-size paper tray, if available.
[2] With 2MB additional third-party RAM; price for 2MB model is $1861.
[3] Extra tray not available.
[4] 4.5MB RAM; extra tray not available.
[5] Unable to get street price due to limited dealer coverage.
[6] 3MB RAM; extra tray not available.
[7] Information unavailable from vendor.
[8] Cost of toner, drum, and developer, averaged over 100,000 pages.
[9] Extra-cost option.
[10] Uses PostScript fonts for HP emulation.
[11] Via software utility.
[12] Two serial ports standard.
[13] LED engine warranted for 5 years.
[14] Dealer referral only.
[15] Varies by dealer.

# Quality Counts: The Best PostScript Output

If you're buying a PostScript printer, you're probably serious about the quality of your printed output. That's why we gave image quality the heaviest weighting in our evaluation of these printers. The good news is that none of the printers in this roundup displayed poor output. Even printers with the lowest print quality (the TI MicroLaser PS35 and the Everex LaserScript LX) earned fairly good scores in that category.

But if you're going PostScript, why not look your best? For the highest-quality output, check out our Best Buy, the Epson EPL-7500.

Some printers offer better looking text than graphics, and vice versa. Generally, the greatest differences in text quality occur in small print, such as 6-point footnote type. But a laser printer's biggest challenge is printing continuous-tone halftone images such as scanned photographs. Potential defects include poor gradations between shades of gray and a "banding" effect that overlays the image. Using a good 256-gray-scale scanner—and knowing how to select the right scanning options—will improve your halftones, but optimum quality will elude you unless your printer can handle its part of the bargain.

**Epson EPL-7500**

10pt. Zebras have the right to remain silent. T
Lester always said. He didn't explain it, but
argument would be pointless. I'd never heard
whinny, out of a zebra. But then again I'd neve
*agitated.* Never seen one with a lioness howling c

6pt. Zebras have the right to remain silent. That's what Lester always said. He dic
I knew an argument would be pointless. I'd never heard a peep, or whinny, out of
again I'd never seen one *agitated.* Never seen one with a lioness howling on its ba
if it would protest on the unfairness of it all with some type of yowl, bark, bel
unexpected, some erie hybrid sound, like the wheeze of a Scottish bagpipe disappear

**TI MicroLaser PS35**

10pt. Zebras have the right to remain silent. Tl
Lester always said. He didn't explain it, but I
argument would be pointless. I'd never heard a
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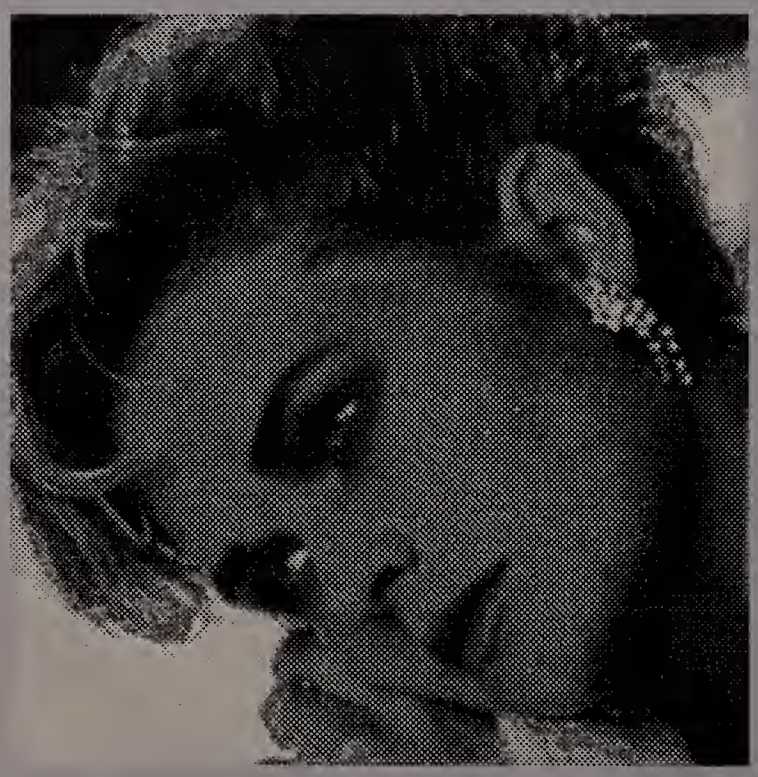
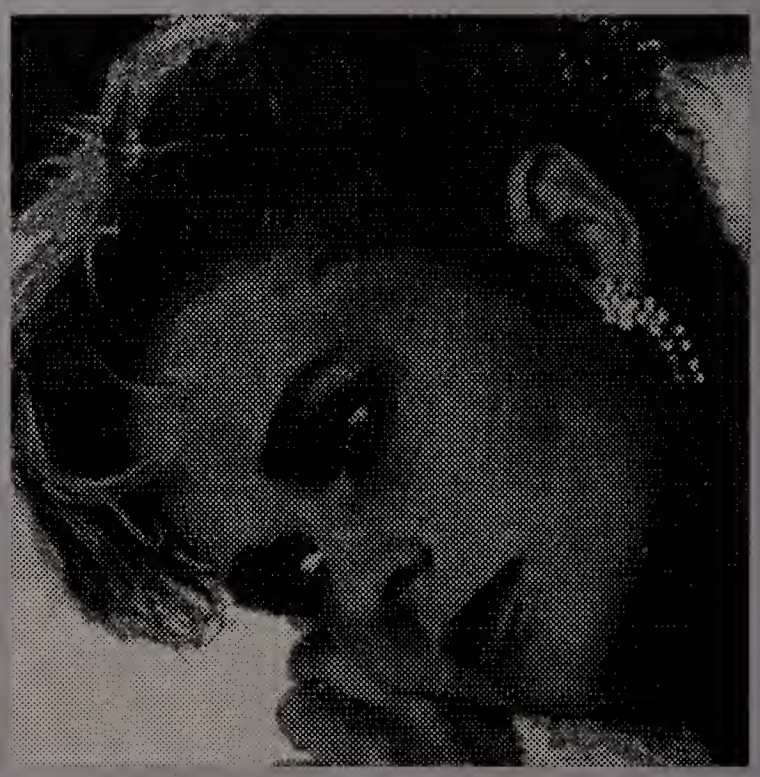
unexpected, some erie hybrid sound, like the wheeze of a Scottish bagpipe disappear

**Epson EPL-7500**



**Everex LaserScript LX**



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*PC Magazine, June '91*

*"Best selling CD-ROM encyclopedia on the market."*
*Bureau of Electronic Publishing*

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Very rarely does a new product come along that turns an industry on its ear. Such is the case of CD-ROM with its massive capacity that allows you to experience the exhilaration of living color, sound and special effects. So you're in for one of the most exciting interactive, sensory experiences you've ever had sitting down. Get three of the current top ten CD-ROM software titles: *The New Grolier Electronic Encyclopedia,™ The Time Table of History* and *The Software Toolworks® World Atlas*, with your special discounted purchase of the high-performance NEC Intersect™ CDR-36 portable CD-ROM reader. Act now and save $500* from the manufacturer's suggested retail price on this exclusive package at just $749* for Macintosh and $849* for IBM XT/AT and $899* for PS/2. Or, upgrade to the fastest CD-ROM reader on the market, the NEC CDR-73 at the low price of $1,099* for Macintosh, $1,199* for IBM XT/AT and $1,299* for PS/2. This essential reference package includes an Interface Kit for either Macintosh or IBM, headphones with CD-audio software diskette to play stereo music CD's, and quick-install program diskette which installs the reader and the three CD titles instantly. The big plus is toll-free telephone access to the NEC hotline for hardware or software technical assistance and a 2-year limited hardware warranty. The supplies for this promotion are limited, so act before January 15, 1992.

System Requirements: IBM PC XT/AT, PS/2 or 100% compatible, 640K available RAM, hard drive with 2MB available space, VGA graphics adaptor, and DOS 3.30 or higher.

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| 602-968-3168 | 800-248-0800 | 800-451-7638 | 800-MEGABYT (800-634-2298) | 201-587-0910 | 800-541-2318 |

*Suggested retail price, actual price may change depending on dealer.

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Circle 188 on reader service card

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## No controller card required!

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**VALITEK**

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# Perhaps it's time to get a faster modem.

**AT ONLY $595*, WHY WAIT?** When you need to send or receive your information *faster*, you need the Sportster 9600® modem from U.S. Robotics.

With the Sportster 9600 you get an affordable, easy-to-use, compact modem that speeds your throughput up to 38,400 bps. Which means lower phone bills and less wasted time.

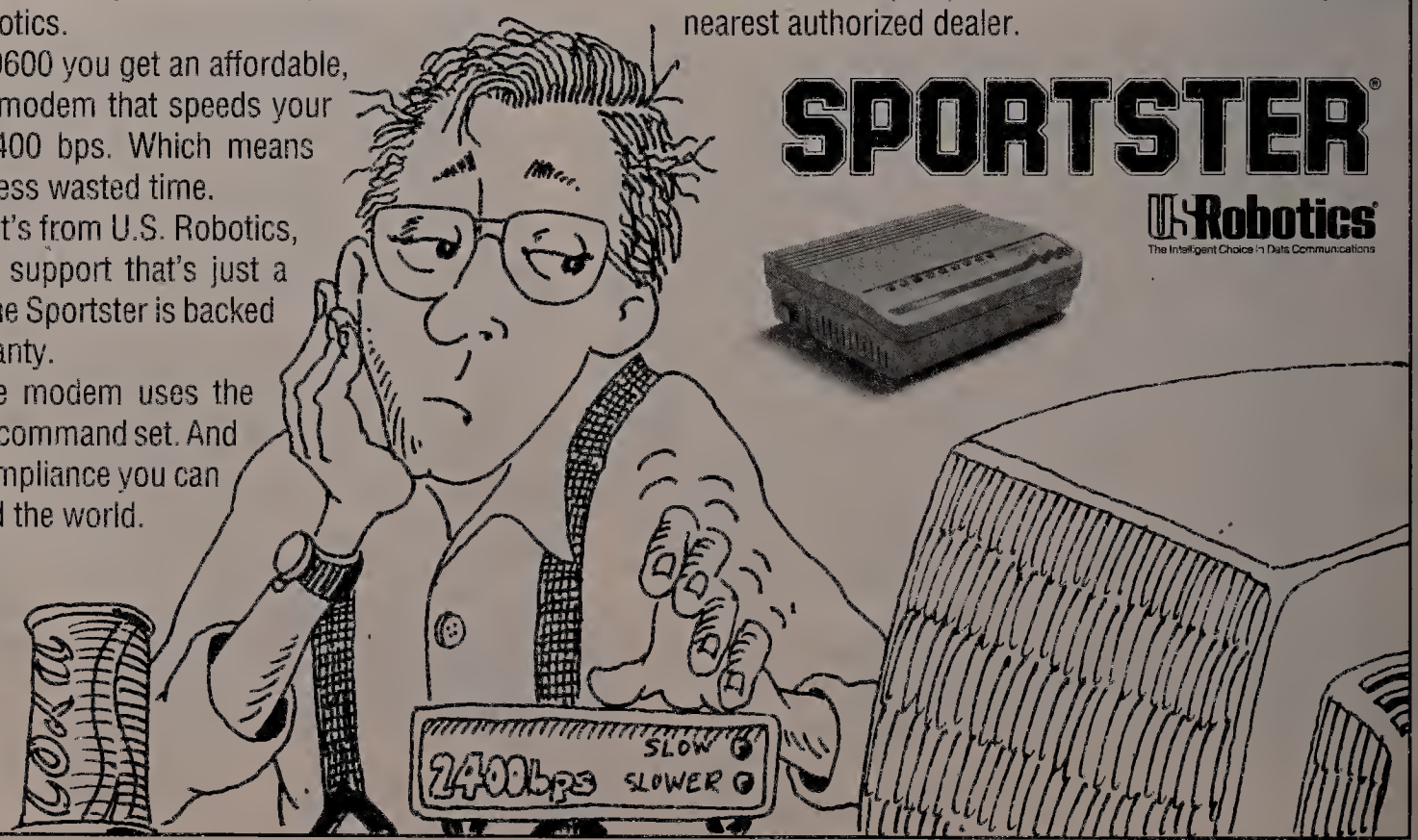
Of course, because it's from U.S. Robotics, you get free technical support that's just a phone call away. And the Sportster is backed by a full five-year warranty.

This fast, affordable modem uses the industry's standard AT command set. And with CCITT and Bell compliance you can talk to modems around the world.

Before you waste anymore time waiting for your modem, call U.S. Robotics at 1(800)DIAL-USR for the name of your nearest authorized dealer.

**SPORTSTER®**

**U.S. Robotics®**
The Intelligent Choice in Data Communications




* For internal version. $645 for external version. Internal version includes communications by Crosstalk®.
Crosstalk is a registered trademark of DCA.

Circle 293 on reader service card

# PostScript Printers: Best of the Rest

*The word is out—PostScript printers are here to stay. And they're getting cheaper all the time. A baker's dozen of new PostScript printers should be available by the time you read this.*

| Model | List price | Rated engine speed (ppm) | Resolution (dpi) | Scalable fonts | Adobe licensed | RISC processor | Standard/ maximum RAM (MB) | Standard paper capacity (sheets) | LaserJet IIP emulation |
|---|---|---|---|---|---|---|---|---|---|
| Dataproducts LZR 960 | $2995 | 9 | 300 | 35 | Y[1] | Y | 2/10 | 250 | Y |
| Digital Equipment DEClaser 1150 | $2849 | 4 | 300 | 43 | Y | N | 2.5/2.5 | 250 | Y |
| GCC Technologies BLP II | $2148[2] | 4 | 300 | 35 | Y | N | 2/4 | 200 | Y[3] |
| GCC Technologies BLP IIS | $3048[2] | 8 | 300 | 35 | Y | N | 2/4 | 200 | Y[3] |
| Lexmark/IBM LaserPrinter 5E | $2692 | 5 | 300 | 35 | Y | N | 2/9 | 200 | Y |
| Mannesmann Tally MT906 PS | $2795 | 6 | 300 | 35 | N | N | 2.5/4.5 | 200 | Y |
| Mannesmann Tally MT911 PS | $3195 | 10 | 300 | 35 | N | N | 2.5/4.5 | 200 | Y |
| NewGen TurboPS/400p | $2995[4] | 4 | 400 | 35 | N | Y | 4/16 | 50 | Y |
| Okidata OL830 LED Page Printer | $1999 | 8 | 300 | 17 | Y | N | 2/4 | 200 | Y |
| Qume CrystalPrint Publisher II | $2995 | 6 | 300 | 39 | N | Y | 3/6 | 100 | Y |
| Sharp JX-9500PS | $2849 | 6 | 300 | 35 | Y | N | 2.5/3.5 | 250 | Y |
| Star Micronics LaserPrinter 4 StarScript | $1995 | 4 | 300 | 35 | N | Y | 2/5 | 50 | Y |
| TI MicroLaser Turbo PS35 | $2249 | 9 | 300 | 35 | Y[1] | Y | 2.5/10.5 | 250 | Y |

[1] Adobe PostScript Level 2.
[2] Includes $149 PC accessories kit with parallel port.
[3] Extra-cost option.
[4] 300-dpi version with 2MB RAM costs $2495.

## WHERE TO BUY

**DataProducts**
6219 De Soto Ave.
Woodlond Hills, CA 91367
800/334-3174,
818/887-8000
**Reader service no. 613**

**Digital Equipment Corp.**
146 Main St.
Maynard, MA 01754-2571
800/344-4825,
508/493-5111
**Reader service no. 614**

**GCC Technologies, Inc.**
580 Winter St.
Walthom, MA 02154
800/422-7777,
617/890-0880
**Reader service no. 615**

**Lexmark Int'l, Inc.**
740 New Circle Rd. NW
Lexington, KY 40511
800/426-2468,
606/232-2000
**Reader service no. 616**

**Mannesmann Tally Corp.**
8301 S. 180th St.
Kent, WA 98032
800/843-1347,
206/251-5520 (fax)
**Reader service no. 617**

**NewGen Systems Corp.**
17580 Newhope St.
Fountain Volley, CA 92708
800/879-4639,
714/641-8600
**Reader service no. 618**

**Okidata**
532 Fellowship Rd.
Mount Laurel, NJ 08054
800/654-3282,
609/778-4184 (fox)
**Reader service no. 619**

**Qume**
500 Yosemite Dr.
Milpitas, CA 95035
408/942-4000
**Reader service no. 620**

**Sharp Electronics**
Shorp Plaza
Mahwah, NJ 07430
800/237-4277,
201/529-8200
**Reader service no. 621**

**Star Micronics America, Inc.**
420 Lexington Ave.
#2702
New York, NY 10170
800/447-4700
**Reader service no. 622**

**Texas Instruments**
P.O. Box 202230
Austin, TX 78720
800/527-3500
**Reader service no. 623**

**For more information about all products in this sidebar, circle reader service no. 902.**

## WHERE TO BUY

**Apple Personal LaserWriter NT**
Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
408/996-1010
LIST PRICE: $2599
ACCESSORIES: legal-paper tray $79, envelope tray $89
**Reader service no. 604**

**Epson EPL-7500**
Epson America, Inc.
20770 Modrona Ave.
Torrance, CA 90509
800/922-8911,
213/782-0770
LIST PRICE: $2999
ACCESSORIES: 2MB RAM $499, 4MB RAM $899, 100-sheet output tray $99, 250-sheet input tray $275
**Reader service no. 605**

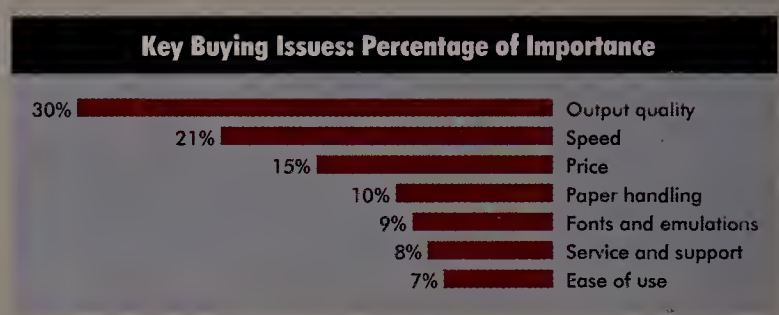
**Everex LaserScript LX**
Everex Systems, Inc.
48431 Milmont Dr.
Fremont, CA 94538
800/628-3837,
510/498-1111
LIST PRICE: $1995
ACCESSORIES: 2MB RAM $200 (factory installed), HP cartridge

## EXECUTIVE SUMMARY

# Epson Knows PostScript

*King of the dot matrix world cracks the laser nut with Best Buy EPL-7500.*

Once ponderous and pricey, today's PostScript printers are sleek, swift, and surprisingly affordable. The **Epson EPL-7500** wins a Best Buy thanks to its stunning text and graphics, fast performance, and easy operation. Runner-up NEC Silentwriter2 checks in cheaper than the EPL-7500, with similarly impressive output. But it just can't match the Epson's blistering print performance.




Excellent ★★★★
Good ★★★
Fair ★★
Poor ★

| | Reader service no. | Output quality | Speed | Price | Paper handling | Fonts and emulations | Service and support | Ease of use | Overall value |
|---|---|---|---|---|---|---|---|---|---|
| **Apple Personal LaserWriter NT** | 601 | ☆☆☆ | ☆½ | ☆☆☆☆ | ☆☆☆½ | ☆☆☆ | ☆☆ | ☆☆ | ★★½ |
| **Epson EPL-7500** | 602 | ★★★★ | ★★★★ | ★★★½ | ★★★★ | ★★★ | ★★★ | ★★★★ | ★★★★ |
| **Everex LaserScript LX** | 603 | ☆☆½ | ☆☆☆ | ☆☆☆☆ | ☆☆½ | ☆☆☆ | ☆☆☆½ | ☆☆☆½ | ★★★ |
| **Microtek TrueLaser MTP 306** | 604 | ☆☆½ | ☆☆☆☆ | ☆☆☆½ | ☆☆ | ☆☆☆ | ☆☆½ | ☆☆☆ | ★★★ |
| **NEC Silentwriter2 Model 90** | 605 | ☆☆☆☆ | ☆☆½ | ☆☆☆☆ | ☆☆☆½ | ☆☆☆ | ☆☆☆½ | ☆☆☆½ | ★★★½ |
| **Okidata OL840 LED Page Printer** | 606 | ☆☆☆ | ☆☆½ | ☆☆☆½ | ☆☆☆½ | ☆☆☆½ | ☆ | ☆☆☆ | ★★★ |
| **Panasonic LaserPartner KX-P4455** | 607 | ☆☆☆ | ☆☆☆ | ☆☆☆½ | ☆☆☆½ | ☆☆☆½ | ☆☆☆ | ☆☆½ | ★★★ |
| **QMS-PS 410** | 608 | ☆☆☆ | ☆☆ | ☆☆☆½ | ☆☆ | ☆☆☆☆ | ☆☆☆ | ☆☆½ | ★★★ |
| **TI MicroLaser PS35** | 609 | ☆☆½ | ☆☆½ | ☆☆☆½ | ☆☆☆½ | ☆☆☆½ | ☆☆ | ☆☆☆ | ★★★ |

Overall value is calculated by multiplying each category rating by the category's weight percentage, summing the results, and rounding to the nearest half number.

## WHERE TO BUY

support $160 (factory installed), 50-sheet face-up output tray $50
**Reader service no. 606**

### Microtek TrueLaser MTP 306
Microtek Labs, Inc.
680 Knox St.
Torrance, CA 90502
800/654-4160,
213/321-2121
LIST PRICE: $1995
ACCESSORIES: 1MB RAM $295, 4MB RAM $895
**Reader service no. 607**

### NEC Silentwriter2 Model 90
NEC Technologies, Inc.
1414 Massachusetts Ave.
Boxborough, MA 01719
800/632-4636,
508/264-8000
LIST PRICE: $2495
ACCESSORIES: 2MB RAM $499, face-up output tray $139
**Reader service no. 608**

### Okidata OL840 LED Page Printer
Okidata
532 Fellowship Rd.
Mount Laurel, NJ 08054
800/654-3282,
609/778-4184 (fax)
LIST PRICE: $2599
ACCESSORIES: 2MB RAM $399, font cards $195-$395 each, 200-sheet paper bin $229, legal-paper tray $89, envelope tray $89
**Reader service no. 609**

### Panasonic Laser-Partner KX-P4455
Panasonic Communications and Systems Co.
2 Panasonic Way
Secaucus, NJ 07094
800/742-8086,
201/348-7000
LIST PRICE: $2995
ACCESSORIES: 2MB RAM $390, legal-paper cassette $59, envelope cassette $85
**Reader service no. 610**

### QMS-PS 410
QMS, Inc.
1 Magnum Pass
Mobile, AL 36618
800/523-2696,
205/633-4300
LIST PRICE: $2795
ACCESSORIES: 1MB RAM $345, 2MB RAM $495, 4MB RAM $795, HP Pro Collection font cards $225 each, 250-sheet paper feed $195
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### Texas Instruments MicroLaser PS35
Texas Instruments
P.O. Box 202230
Austin, TX 78720
800/527-3500
LIST PRICE: $1749
ACCESSORIES: 1MB RAM $239, font cards $135–$205, HP and Diablo emulation cards $175 each, 250-sheet paper bin $275, envelope feeder $275, legal-paper tray $55
**Reader service no. 612**

**For more information about all products in this article, circle reader service no. 901.**

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It's everything a Windows spreadsheet
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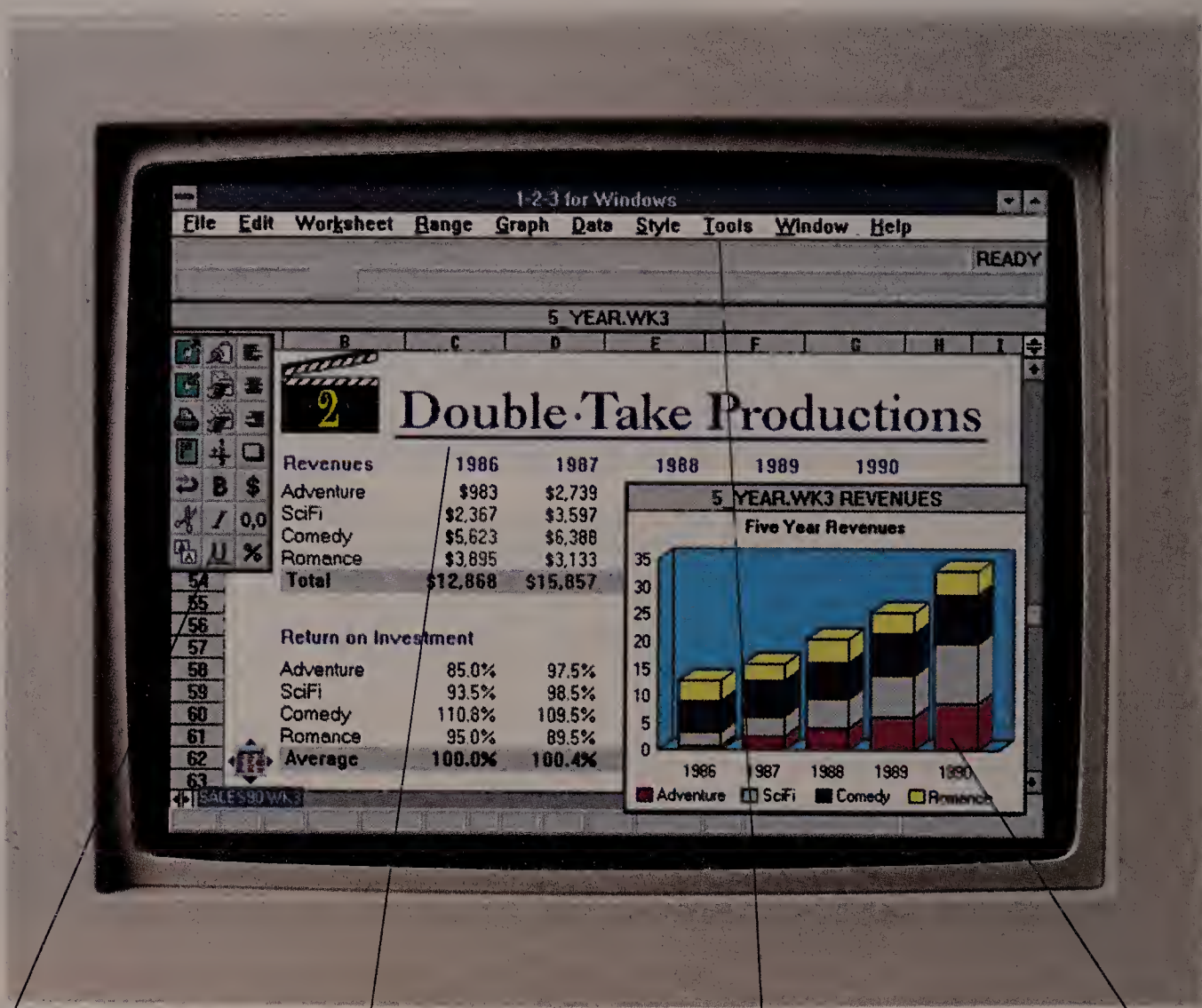
goals in mind.

First, make it a full-fledged Windows application. Second, introduce innovations that




*Palette of customizable SmartIcons can be sized and placed anywhere on the screen.*

*Includes Adobe Type Manager® (ATM®), the leading scalable font manager, for outstanding spreadsheet publishing and presentations.*

*Feel right at home with our true Windows interface. With it, you can easily integrate spreadsheet data with other Windows applications.*

*Interactive graph gallery lets you preview and select by example a wide range of char and graph types.*

ATM

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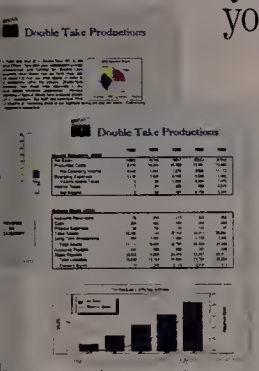
liver a balance of power and simplicity. ıd third, make it fully compatible with e earlier versions of 1-2-3 that millions users are familiar with.

Well, we've done all this and more. hich is no doubt why 1-2-3 for Windows as awarded Byte Magazine's *Best New indows Application* at Comdex/Spring '91.

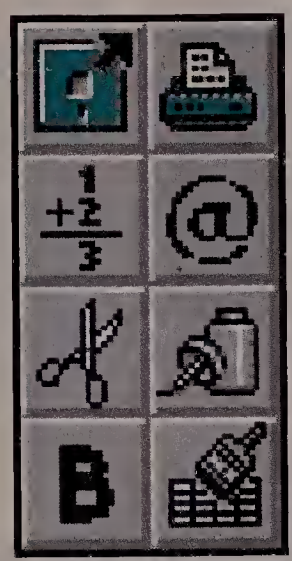


*hen you're ready to int, your results will nothing short of rfection. And thanks its Auto Compress ature, you can easily ake an entire report on one page.*

One of the first things you'll notice about 1-2-3 for Windows is its SmartIcons™—simple, one-click shortcuts to performing common spreadsheet tasks. For example, sum a row of numbers, make text bold, create a graph, save or print a file, even run a macro—all in a single step.

Unlike the Toolbar™ in Microsoft® Excel, 1-2-3 for Windows actually lets you create your own ons for the tasks that are unique to you.

And yes, 1-2-3 for Windows takes ll advantage of the Windows environment, with pull-down menus, dialogue oxes, sizable windows, full DDE support nd everything else you'd expect to find Windows.



*Customizable SmartIcons give you push-button access to basic and advanced spreadsheet functionality. Over 50 standard icons come with the program, or create new icons to suit your needs. For example, sum a column or a row, or change text to bold—all in a simple step.*

What's more, with its interactive graph gallery, you can select by example a wide range of graph types, including true 3D. Altogether, over 200 different graph style combinations.

Finally, to make the move to Windows a simple one, we've included 1-2-3 Classic® commands in the program. At the push of the slash key, the 1-2-3 menu appears on the screen. So not only are all your existing files, styles, and macros compatible with 1-2-3 for Windows, but the familiar keystrokes are too.

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## 1-2-3 for Windows

Lotus

*Suggested retail price. Offer expires 12/31/91.
**Please have your credit card and product package ready when you call. In Canada, call 1-800-668-1509.

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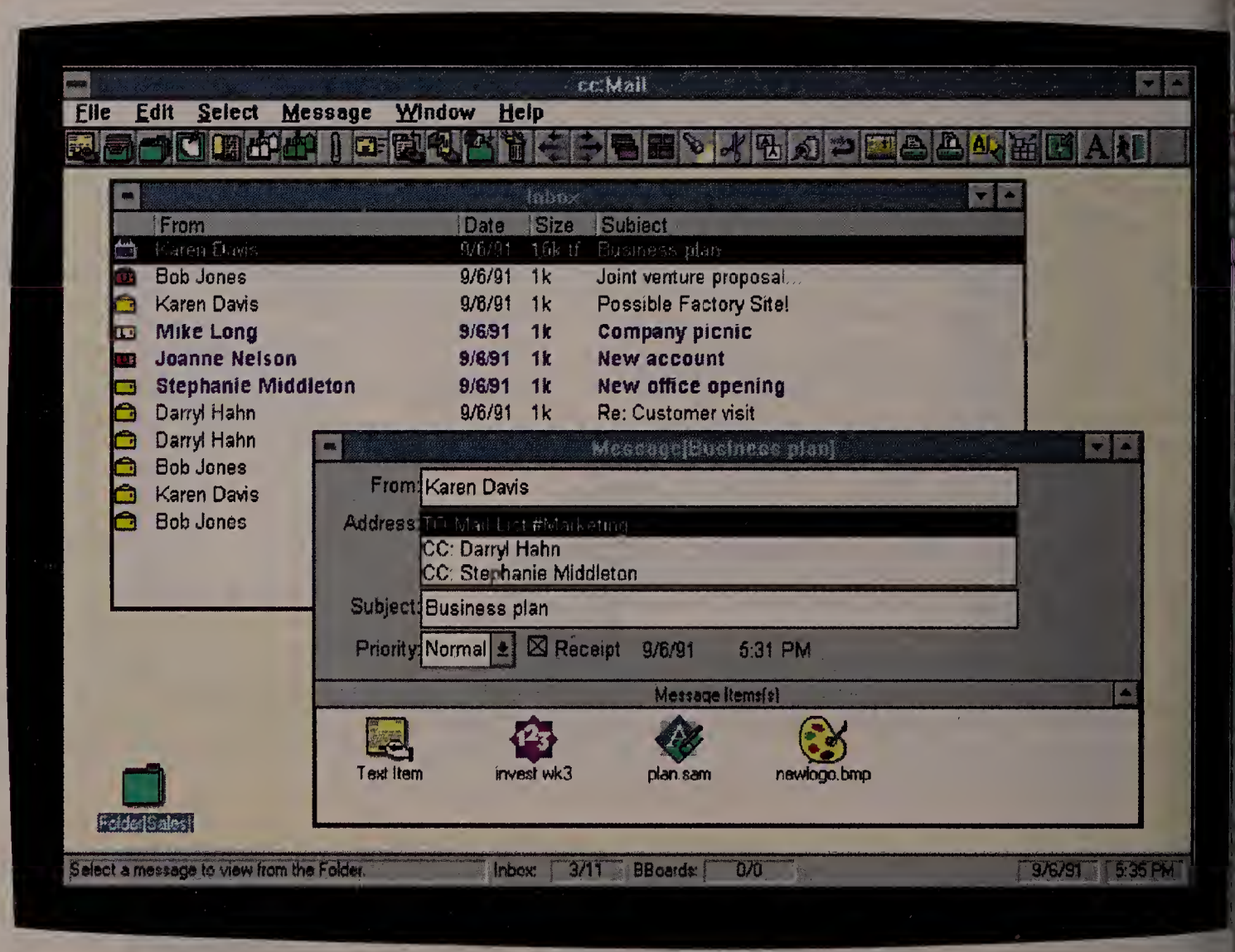


*Over a million satisfied customers have already given cc:Mail a first-class rating. For example, Windows users love its easy-to-use interface, SmartIcons™ and application integration. And* PC World *says "Sending a cc:Mail message is easier than addressing an envelope and licking a stamp."* 9/91*

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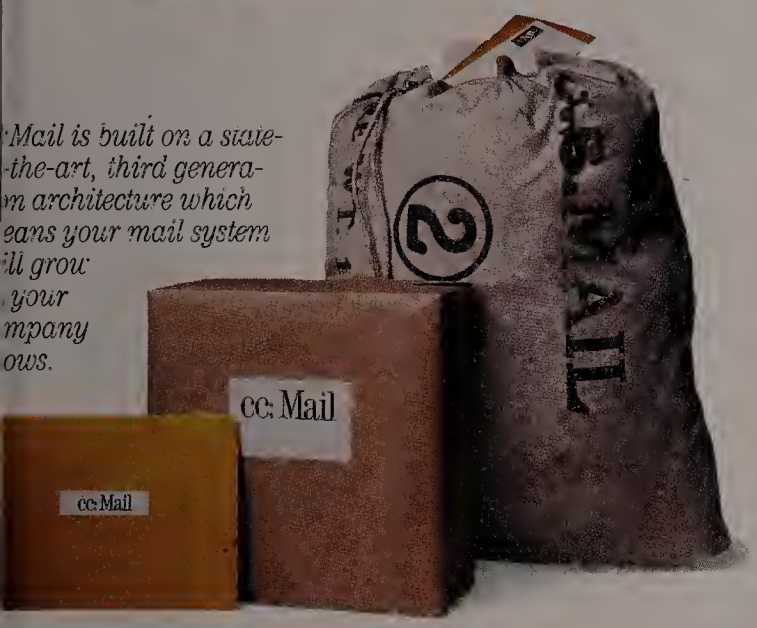


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cc:Mail

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LAN TIMES READERS CHOICE 1990 1991

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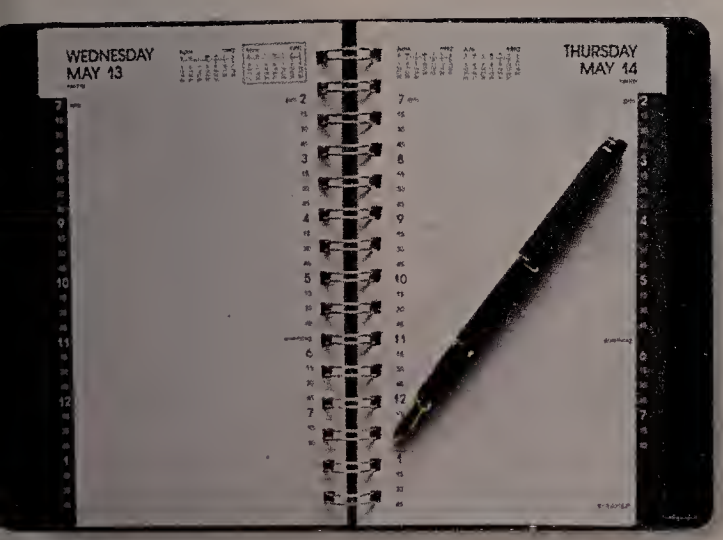


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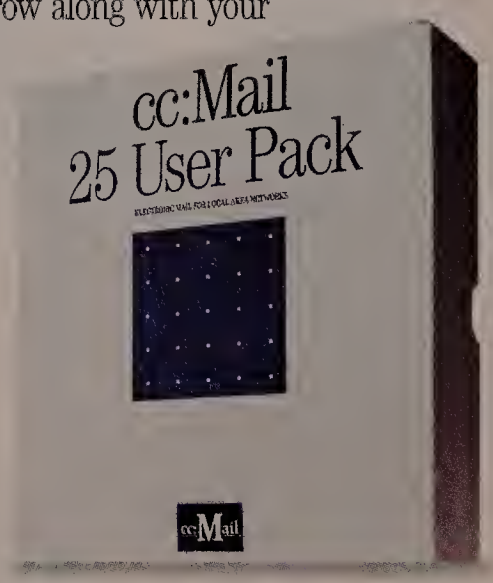


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NEC

# WINDOWS MONITORS

**Now's the time to consider a larger, sharper display. These 12 king-size monitors make Windows shine, and several cost you little more than today's standbys.**

Can your monitor display everything that *Windows* has to show? Probably not. The whole idea of *Windows* is to serve up multiple applications running at the same time, so you can cut and paste, read your electronic mail, and more without breaking stride. To see those applications full-blown, you need more screen area and higher resolution than the usual 12- to 14-inch VGA monitor provides.

Large, high-resolution monitors were once affordable only to those with deep pockets. Fortunately, at this writing, monitor prices are taking a dive, and you can now buy these babies for less than $1000—and that's a price that makes sense for any serious *Windows* user.

In this review, we've rounded up a dozen high-res monitors measuring 15 to 17 inches diagonally and put them to the test. All of them are *multiscan* monitors, which means they can adapt to several resolutions—including 1024 by 768, a popular new resolution more than twice as sharp as VGA. Better still, this dazzling dozen can do 1024 by 768 *noninterlaced*, a scanning technique that minimizes eye-wearing flicker.

To further protect you from eyestrain, we narrowed the field to include only monitors that support a 70-Hz refresh rate. Studies show that monitors displaying 70 or more screens per second—instead of the 60 screens per second you see on standard VGA—enable you to work for longer periods of time without experiencing eye fatigue.

In other words, this is a great-looking bunch of monitors—the cream of the crop among affordable displays.

When evaluating these overachievers, we measured image sharpness, color intensity, glare, and actual (as opposed to advertised) screen area. We also inspected the controls for accessibility and range, and took into account size and weight—critical factors in a crowded cubicle. And though many of these monitors are just now shipping, we tested vendor service and support so you'll know what to expect if you need help.

A couple of clear winners emerged, the Mag MX15F and the NEC MultiSync 4FG. Both of these 15-inchers won Best Buys by providing an excellent balance of low price and superb image quality. However, if you simply must have the best image possible, consider

TJ BYERS

Mag's high-priced, 17-inch MX17F.

Remember that to get the full benefit of these monitors, you'll need a super-VGA board that supports high resolution and fast refresh (see "Screen Gems: Super-VGA Boards," August 1991). If your present board doesn't support them, plan on spending $200 to $300 for a replacement—or $500 or more if you want a board that also delivers high video speed.

As we go to press, the wave of affordable, next-generation monitors is just beginning to crest. You can't go wrong with the top-rated monitors here, but many comparable ones are on the way. Check the table of newly introduced units at the end of this review—and get set for a sharper, brighter future.

**With prices on large, high-resolution monitors taking a dive, you can now buy one of these babies for under $1000.**

*TJ Byers is a contributing editor for* PC World.

**For more information about all products in this article, circle reader service no. 906.**

## EXECUTIVE SUMMARY

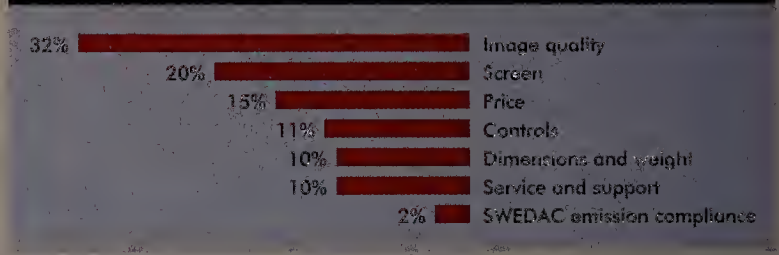
# NEC and Mag Do Your Eyes a Favor

*With low flicker and big screens, these monitors show Windows at its best—without overcharging for the view.*

BEST BUY

The Best Buy **NEC MultiSync 4FG** stands head and shoulders above the rest, thanks to its excellent price, small footprint, and dazzling images—plus unique controls that help match on-screen color with printed output. The **Mag MX15F** also qualifies for a Best Buy. While it lacks frills and low-emission compliance, this monitor offers comparable size and image quality at a lower price.

**Key Buying Issues: Percentage of Importance**




Excellent ★★★★
Good ★★★
Fair ★★
Poor ★

| | Reader service number | Image quality | Screen | Price | Controls | Dimensions and weight | Service and support | SWEDAC emission compliance | Overall value |
|---|---|---|---|---|---|---|---|---|---|
| **Aamazing CM-1726X** | 746 | ☆☆☆☆ | ☆☆☆½ | ☆☆☆ | ☆☆☆ | ☆☆½ | ☆☆☆ | n/a | ★★★½ |
| **ADI 4A MicroScan** | 747 | ☆☆ | ☆☆☆½ | ☆☆☆☆ | ☆☆☆☆ | ☆☆☆½ | ☆☆☆☆ | n/a | ★★★ |
| **CTX CPS-1760** | 748 | ☆☆☆ | ☆☆☆☆ | ☆☆☆½ | ☆☆☆☆ | ☆☆ | ☆☆☆½ | n/a | ★★★½ |
| **Dell GPD-16C** | 749 | ☆☆☆ | ☆☆☆½ | ☆☆☆ | ☆☆☆☆ | ☆☆½ | ☆☆☆☆ | n/a | ★★★ |
| **IOcomm CM-5128** | 750 | ☆☆☆☆ | ☆☆☆½ | ☆☆☆☆ | ☆☆☆ | ☆☆☆☆ | ☆☆☆½ | n/a | ★★★½ |
| **IOcomm CM-7128** | 750 | ☆☆☆☆ | ☆☆☆☆ | ☆☆ | ☆☆☆½ | ☆☆ | ☆☆☆½ | n/a | ★★★½ |
| **Mag MX15F** | 751 | ★★★★ | ★★★½ | ★★★★ | ★★★★ | ★★★★ | ★★★★ | n/a | ★★★★ |
| **Mag MX17F** | 751 | ☆☆☆☆ | ☆☆☆☆ | ☆ | ☆☆☆☆ | ☆☆½ | ☆☆☆☆ | n/a | ★★★½ |
| **Nanao FlexScan 9080i** | 752 | ☆☆☆½ | ☆☆☆½ | ☆☆½ | ☆☆☆☆ | ☆☆☆ | ☆☆☆½ | ☆☆☆ | ★★★½ |
| **NEC MultiSync 4FG** | 753 | ★★★★ | ★★★½ | ★★★★ | ★★★★ | ★★★★ | ★★★★ | ★★★★ | ★★★★ |
| **Taxan MultiVision 875** | 754 | ☆☆☆☆ | ☆☆☆☆ | ☆☆ | ☆☆☆ | ☆☆☆½ | ☆☆☆½ | n/a | ★★★½ |
| **ViewSonic 7** | 755 | ☆☆☆☆ | ☆☆☆☆ | ☆☆½ | ☆☆☆½ | ☆☆ | ☆☆☆ | n/a | ★★★½ |

Overall value is calculated by multiplying each category rating by the category's weight percentage, summing the results, and rounding to the nearest half number.

## Aamazing CM-1726X

**PROS:** Excellent sharpness, compact
**CONS:** Small image area for a 17-incher, slow turnaround for repairs

Kicking off this roundup is Aamazing's incredibly good-looking, 17-inch CM-1726X. The screen's dot pitch is a tight 0.26mm—and the image is crisp and clear across the entire tube. Moreover, the unit is small and light for a 17-inch monitor.

So why isn't this monitor a Best Buy? First, its estimated street price of $1150 is nothing special. Second, the viewable screen area is only 101 square inches. That's because the CM-1726X is one of only two monitors in this roundup that lacks a microprocessor and can't *overscan* to fill the screen all the way to the edges.

Tech support calls are on your dime, and the 14-day turnaround for repair or replacement is simply out of step with the competition. You won't find a 17-inch monitor with comparable image quality for the price, but buy this unit only if you can swing good dealer support.

**With a fine 0.26 dot pitch, crisp focus, and accurate color, the CM-1726X offers superb image quality.**

**The MicroScan's sensible controls, low cost, and compact footprint can't make up for imprecise color and focus.**

## ADI 4A MicroScan

**PROS:** Low price, light weight
**CONS:** Small viewing area, fuzzy focus

If size and weight are primary concerns, check out the $800 (estimated street price) ADI 4A MicroScan. At just 30 pounds, it won't dent even the flimsiest plastic PC, and its small size lets it fit in tight spots.

Otherwise, look elsewhere. The 85-square-inch viewing area ties for the smallest in the roundup. Moreover, the screen has a *convergence* problem that results in color "shadows"—thin red edges around white text characters, for example. Unfortunately, this is an inherent problem that can't be corrected by a repair person.

In some respects, competitors could learn from this monitor. Well-tuned push buttons make screen adjustments fast and simple. The warranty is two years, and tech support is 12 hours a day, toll free.

Impressive, but as the ad says, image is everything. The MicroScan is simply too fuzzy to earn a recommendation.

## CTX CPS-1760

**PROS:** Low price, large viewing area, video mode indicator
**CONS:** Fuzzy corners

With an estimated street price of just $950, the CTX CPS-1760 is the only 17-inch monitor in this roundup that sells for less than $1000. For that you get an expansive 114 square inches of screen area. While the focus isn't quite as sharp as that of the other 17-inchers, especially at the corners, it's good enough for all but the smallest text.

The push-button controls are typematic—you hold the button down to repeat the changes—just like your PC's keyboard. An LED readout tells you what video mode the screen is displaying.

The monitor itself has a one-year warranty. But there's a two-year warranty on the CRT, which means you have to pay for the labor of replacing it if it conks out in the second year (about $45, plus shipping). If you have big-screen dreams on a beer budget, and you don't mind a little fuzziness in the corners, this 17-inch monitor is for you.

**The lowest priced of the 17-inchers, the CTX CPS-1760 offers a big viewing area and a handy video mode indicator.**

## Dell GPD-16C

**PROS:** Overnight replacement
**CONS:** Large chassis, hazy screen

Moderately priced at $999 (direct), the Dell GPD-16C uses an older curved-face CRT with an etched screen for diffusing glare. It also has a dot pitch of 0.31mm—the coarsest in the roundup. Not surprisingly, the image isn't as sparkling as you'll find on today's 0.28mm, nearly flat screens. In addition, it's a fairly large box.

The GPD-16C has every control you could wish for, including manual degaussing, which corrects drifting colors. But plan on buying a small screwdriver, because you must rotate tiny, slotted controls to make adjustments.

The turnaround time is nothing short of fantastic, with guaranteed overnight replacement via Federal Express. If you can get a discount by buying the monitor with one of Dell's PCs, consider it seriously. But if you want to upgrade, you can do a lot better for less money.

**The GPD-16C could be a good deal—if you buy it at a discount with one of Dell's fine PCs.**

**An extremely low $500 street price and beautiful images make IOcomm's 15-inch CM-5128 a very attractive buy.**

## IOcomm CM-5128: ThinkSync 5

**PROS:** Lowest price, great image quality, light weight
**CONS:** No automatic image adjustment, small screen

At a $500 estimated street price, the CM-5128 from IOcomm is far and away the least expensive monitor in this roundup. It's both lightweight and small, measuring just 15.7 inches deep, perfect for cramped quarters. And while the CM-5128 ties for the smallest screen area (85 square inches), its image is crisp to the corners and glare free.

Plan on doing some tweaking, though, because the CM-5128 is one of only two monitors here that lacks a microprocessor. Exit *Windows* to the DOS prompt and you'll scramble for the horizontal position control. Fortunately, the controls are easy to locate and (because they're simple twist knobs) even easier to use.

If you're looking for a big, high-res display that costs little more than a 14-inch one, and you don't mind fiddling with knobs, buy this monitor. Only the lack of a microprocessor keeps this unit from a Best Buy.

## IOcomm CM-7128: ThinkSync 7M

**PROS:** Large, well-focused screen; some on-site service
**CONS:** Big, heavy

Big brother to the IOcomm CM-5128, the microprocessor-controlled CM-7128 has a large, well-focused 116-square-inch screen. As with the big-screen Taxan and ViewSonic units, which use the same picture tube, you get over 50 pounds of sheer heft and a monster footprint—at an estimated street price between $1200 and $1400.

The push-button screen controls are typematic and reside under a front panel cover. You have to press a memory button to record your new settings, and there's no recall button to bring the screen back to factory specs should you find yourself in the twilight zone.

On-site service is for southern California only, but we've been told that some of the service depots will arrange on-site service for this model. The CM-7128 is huge and it's not cheap, but better turnaround time and convenient control location put it ahead of similar units.

**It's big and heavy, but the 17-inch CM-7128 offers great image quality and ample viewing area.**

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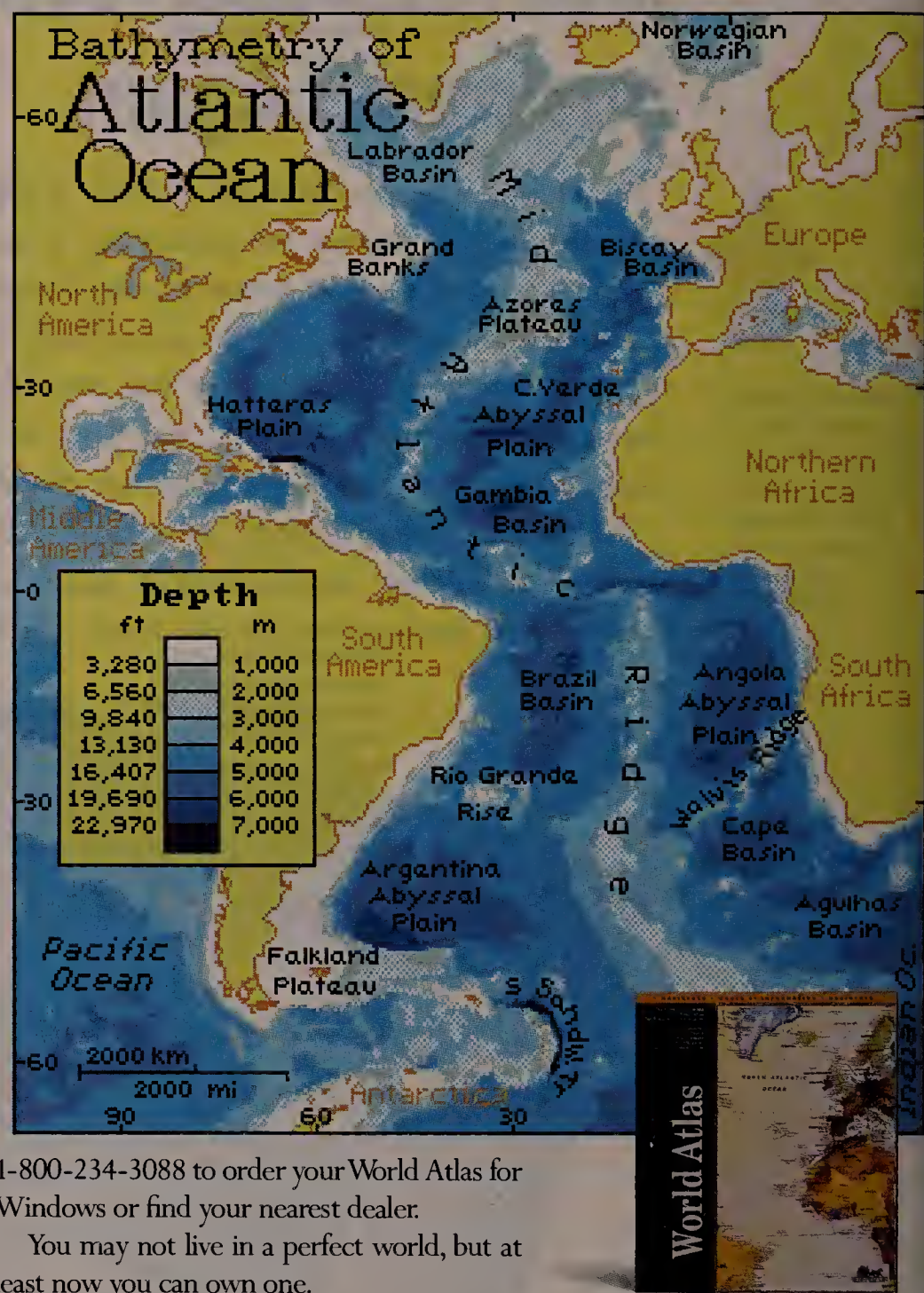
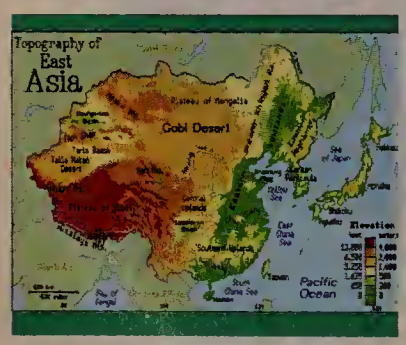
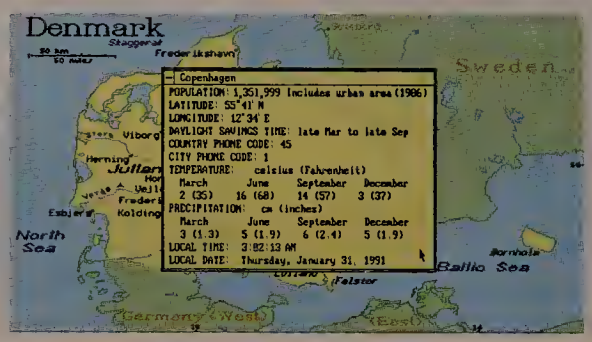



What a relief.

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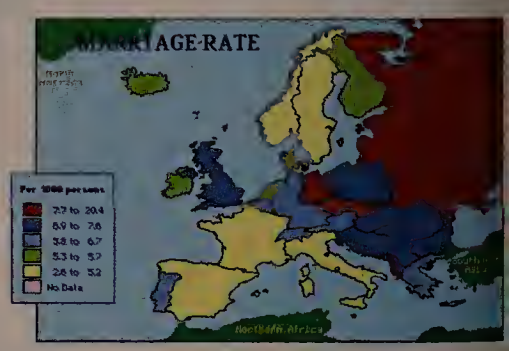


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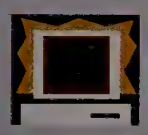
THE SOFTWARE TOOLWORKS

Circle 270 on reader service card

# Buying Smart: Large-Screen, Super-VGA Monitors

When running *Windows* at high resolutions, there's no compromising on screen size. But there's more to consider than viewing area. Sharpness, brightness, and color intensity all play a role in image quality.



**SCREEN**

With *Windows*, if you increase screen resolution and use the same old 14-inch monitor, screen fonts grow smaller. That's because the characters are made up of a fixed number of dots, so letters that are ⅛-inch tall on a 14-inch 640 by 480 VGA screen are only just over 1/16-inch tall on a 14-inch 1024 by 768 screen. Raise the resolution and increase the screen size, and the characters won't shrink as much.

Published screen size is the diagonal measurement of the CRT (or picture tube) from corner to corner before it's mounted in the cabinet. Subtract for the bezel, and you end up with a smaller-than-advertised screen (a 15-inch screen is typically more like 13½ inches). The total viewable image area (in square inches) is a better way to compare screen sizes, and we've provided this for your convenience.

Screen glare varies according to screen flatness and screen treatment. As a rule, the flatter the screen, the easier it is to eliminate glare by using the tilt-and-swivel base to adjust the viewing angle.

**IMAGE QUALITY**

Image quality is greatly affected by *dot pitch*—the distance between tiny picture elements on the screen. Generally, the smaller the dot pitch, the crisper the image. On a 17-inch monitor, the dot pitch should be no greater than 0.31mm—about 80 dots per inch; 15-inch screens demand 0.28mm or better.

Of course, the finest dot pitch in the world can't make up for bad focus or poor *color registration* (commonly called *convergence*). Users often create bad focus themselves by turning up the brightness too high—overdriving the electronics—or setting the contrast too low. Many monitors limit the range of both.

Poor convergence is caused by a misalignment of the red, blue, and green electron beams. It results in white dots tinged with crescents of color that decrease image sharpness. You can correct slight convergence problems with a *pincushion/barrel* convergence control, which several of the monitors here offer. Really bad convergence problems are caused by incorrect gun settings at the factory or damage incurred in shipping and require the services of a technician.

Stray magnetic fields also affect convergence. Seven of these monitors have a manual *degaussing* button that neutralizes screen magnetization. If your monitor lacks a degausser, you can pick up a handheld degaussing coil at Radio Shack.

**DIMENSIONS AND WEIGHT**

A number of Fortune 1000 companies have a size and weight restriction on monitors, usually because there's only so much space in the standard company cubicle. Check your company's height and depth restrictions before buying. If the monitor is to sit on the PC, make sure the PC can handle the weight; many small-footprint PCs can't bear the load of a 50-pound, 17-inch behemoth.

**CONTROLS**

The screen controls for the monitors in this roundup are more versatile and easier to use than controls found on most smaller units. Most incorporate a programmable microprocessor that analyzes and remembers size and centering adjustments for the different video modes you work with. Just make sure the controls and power switch are accessible from the front of the monitor, or plan on growing gorilla-length arms.

**SWEDAC EMISSION COMPLIANCE**

Possible health risks associated with monitors are a growing concern. Two monitors in this roundup comply with SWEDAC's emission guidelines. See "Monitor Emissions: Hazard or Hype?" for details.

**SERVICE AND SUPPORT**

Because these monitors are more complex than standard VGA monitors, there's more to go wrong. Demand at least a one-year warranty, but two years is obviously preferable. A central tech support number with long hours can help you fix minor problems (especially those due to user misadjustments).

However, most monitor problems require a qualified repair technician. On-site service saves a trip to the shop and eliminates problems caused by moving the monitor, but few vendors had their on-site policies hammered out by press time. Two companies offer overnight express replacement, a godsend if you don't have a backup monitor.

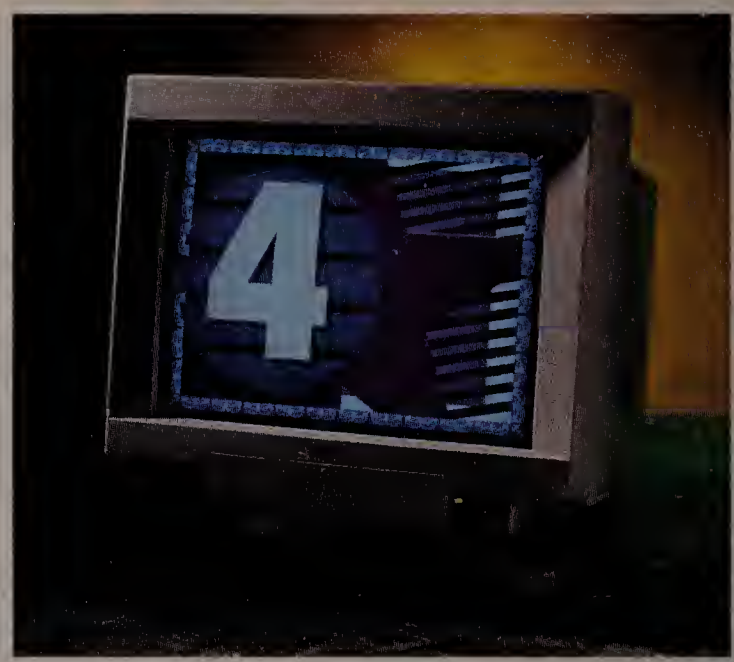
## Mag MX15F

**PROS:** Low price, video mode indicator
**CONS:** Small screen

With a street price of just $700, the Mag MX15F costs the least among the microprocessor-controlled 15-inch monitors. Despite the small 87-square-inch viewing area, *Windows* fonts come through crisp and clear. Moreover, the Mag has the lowest profile of all the monitors reviewed.

As with the CTX, the Mag's push-button controls are typematic; they work smoothly and record your changes automatically. A handy LED indicator displays the current video mode, a nice feature for those who switch between *Windows* and other applications.

The warranty is one year for parts and labor, but with a two-year warranty on the CRT; approximate replacement cost of the CRT in the second year is $110, including shipping. With its small size, clear images, and hot price, this sizzling monitor roundly deserves its Best Buy.




**A terrific screen, compact cabinet, and intelligent image adjustment all for $700 on the street?**

**If you can afford it, the big, beautiful MX17F will furnish you with the best image quality available in its class.**

## Mag MX17F

**PROS:** Large screen, exceptional clarity
**CONS:** Expensive, heavy

The MX17F is the best-looking monitor of the crop. Thanks to a small 0.26mm dot pitch, the screen text of this baby is so large and clear that users won't need their reading glasses. But with nearly 20 inches of depth and 50 pounds of heft, you'll need a fair amount of elbow room and a PC with a solid cabinet. And with an estimated street price of $1450, this unit is also the most expensive one we reviewed.

Although the push buttons are typematic, they are easy to control. There's no recall button, but the controls won't put you into the outer limits. An LED displays the current video mode.

Like its baby brother, the MX17F has a one-year warranty for parts and labor plus a two-year warranty on the CRT. The screen on this beauty is so great that it defies comparison. The only question is whether you can justify its high cost for *Windows* work alone.

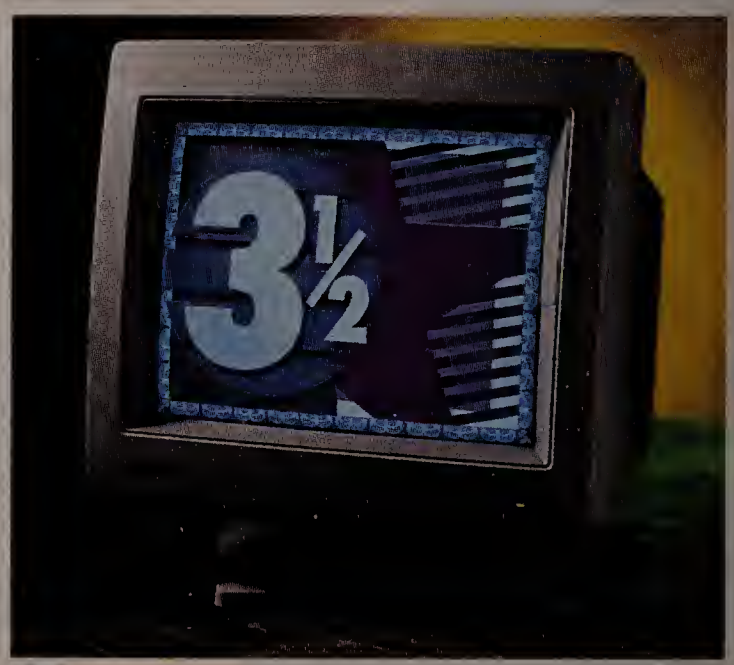
## Nanao FlexScan 9080i

**PROS:** SWEDAC Level 1 compliance, sharp focus
**CONS:** Curved-face CRT

The 16-inch FlexScan 9080i displays an impressively sharp image, though it uses an older, curved-face CRT, which causes more glare than flat-screen models. The street price of $1200 is about average for a monitor of this size.

The FlexScan's controls are unique. Instead of using push buttons, the monitor uses one knob for all adjustments. You simply choose the screen function and start twisting—a fast, accurate method. Another switch changes the display to black-and-white or amber.

The FlexScan is one of a handful of color monitors that meet SWEDAC's low-emission radiation standards. Compliance is with Level 1 only, not the more stringent Level 2. If you're worried about radiation, then the 9080i is one of few choices—but check out the NEC MultiSync 4FG before deciding.




**One of two low-emission monitors reviewed, the FlexScan also has the handiest controls of any monitor we've seen.**

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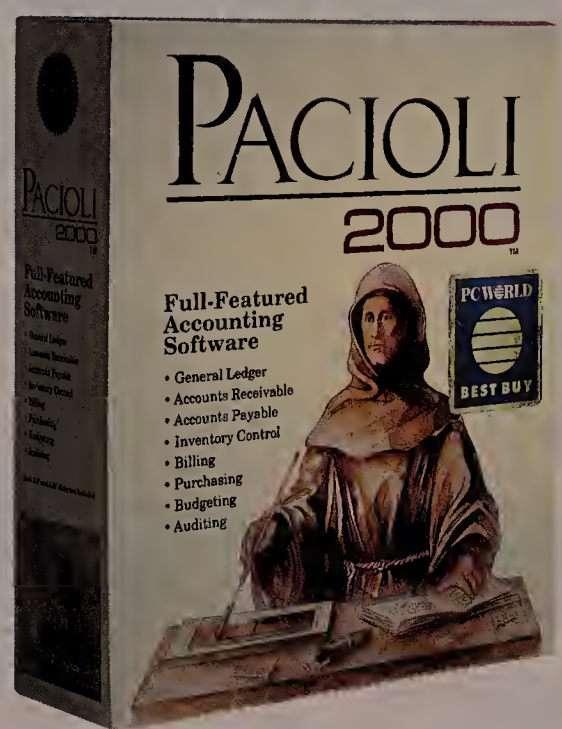


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***Minimum Hardware Requirements:*** *IBM or compatible computer with 500Kb of free memory available, hard disk, MS-DOS 2.1 or later (3.1 or later for networks), and 132 column dot matrix printer in compressed mode.*

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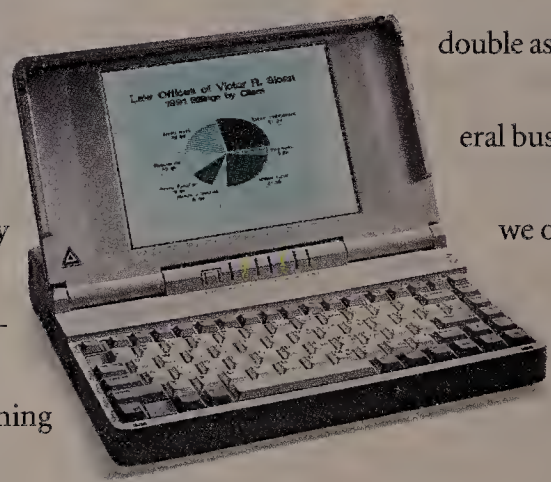

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FEATURES EVALUATION

# Big Monitors for Wide-Open Windows

*Large displays like these let you see several Windows applications full-blown. Beautiful screens, low street prices, and intelligent controls earn Best Buys for the NEC 4FG and Mag MX15F.*

● Yes
○ No

| | Amazing CM-1726X | ADI 4A MicroScan | CTX CPS-1760 | Dell GPD-16C | Iocomm CM-5128 | Iocomm CM-7128 | Mag MX15F | Mag MX17F | Nanao FlexScan 9080i | NEC MultiSync 4FG | Taxan MultiVision 875 | ViewSonic 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard features** | | | | | | | | | | | | |
| Street price | $1150[1] | $800[1] | $950[1] | $999 | $500[1] | $1300[1] | $700 | $1450[1] | $1200 | $825[1] | $1300 | $1200[1] |
| List price | $1599 | $859 | $1495 | $999 | $695 | $1995 | $1099 | $1549 | $1699 | $899 | $1978 | $1999 |
| Video-mode indicator | ○ | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | ● | ○ | ○ |
| **Screen** | | | | | | | | | | | | |
| CRT size (diagonal inches) | 17 | 15 | 17 | 16 | 15 | 17 | 15 | 17 | 16 | 15 | 17 | 17 |
| Viewable area (square inches) | 101 | 85 | 114 | 108 | 85 | 116 | 87 | 116 | 104 | 85 | 120 | 116 |
| Dot pitch (mm) | 0.26 | 0.28 | 0.28 | 0.31 | 0.28 | 0.28 | 0.28 | 0.26 | 0.28 | 0.28 | 0.28 | 0.28 |
| Flat screen | ● | ● | ● | ○ | ● | ● | ● | ● | ○ | ● | ● | ● |
| **Dimensions and weight** | | | | | | | | | | | | |
| Height (inches) | 15.9 | 14.2 | 17.1 | 16.5 | 14.2 | 16.9 | 13.7 | 16.5 | 15.9 | 15.5 | 15.2 | 16.9 |
| Depth (inches) | 16.9 | 15.4 | 16.5 | 18 | 15.7 | 19 | 17.3 | 19.5 | 17.7 | 16.5 | 17.1 | 19 |
| Weight (pounds) | 46 | 30 | 44 | 46 | 32 | 51 | 37 | 50 | 45 | 39 | 51 | 51 |
| **Controls** | | | | | | | | | | | | |
| Microprocessor controlled | ○ | ● | ● | ● | ○ | ● | ● | ● | ● | ● | ● | ● |
| Front-panel power switch/ brightness/contrast | ●/●/● | ●/●/● | ●/●/● | ●/●/● | ●/●/● | ●/●/● | ●/●/● | ●/●/● | ●/●/● | ●/●/● | ○/○/○ | ●/●/● |
| Reset/recall | ○ | ● | ○ | ○ | ○ | ○ | ● | ○ | ○ | ● | ● | ○ |
| Pincushion/barrel convergence | ○ | ○ | ○ | ● | ● | ○ | ● | ○ | ● | ● | ● | ○ |
| Manual degauss | ● | ○ | ○ | ● | ○ | ● | ● | ● | ● | ● | ○ | ● |
| **SWEDAC emission compliance** | ○ | ○ | ○ | ○ | ○ | ○ | ● | ○ | ●[2] | ● | ○ | ○ |
| **Service and support** | | | | | | | | | | | | |
| Warranty (months) | 12 | 24 | 12[3] | 12 | 12 | 12 | 12[3] | 12[3] | 12 | 12 | 24 | 12 |
| On-site service less than $100 | ○/○ | ○/○ | ○/○ | ○/○ | ●/● | ●/● | ● ● | ○/○ | ○/○ | ● ● | ○/○ | ○/○ |
| Vendor support | | | | | | | | | | | | |
| Central support/toll-free | ●/○ | ●/● | ●/● | ●/● | ●/● | ●/● | ● ● | ●/● | ●/● | ● ● | ●/● | ●/● |
| Daily support (hours) | 8.5 | 12 | 12 | 15 | 9 | 9 | 9 | 9 | 10 | 9.5 | 10 | 10 |
| Weekend support | ○ | ○ | ○ | ● | ○ | ○ | ● | ○ | ○ | ● | ○ | ○ |
| Electronic BBS/fax | ○/● | ●/● | ○/● | ●/● | ○/● | ○/● | ● ● | ●/● | ○/● | ● ● | ●/● | ○/● |
| Turnaround policy | 14 days | 3 days | 3–5 days | 24 hrs[4] | 3 days | 3 days | 3 days | 3 days | 2–3 days | 24 hours | 3 days[5] | 7–10 days |
| Vendor-to-dealer support | | | | | | | | | | | | |
| Dedicated support staff required | distributor | ● | distributor | direct | ○ | ○ | distributor | distributor | ○ | ● | distributor | ○ |
| Support staff training required | distributor | ● | distributor | direct | ○ | ○ | distributor | distributor | ● | ● | distributor | ● |
| Dedicated support line for dealers | distributor | ○ | distributor | direct | ○ | ○ | distributor | distributor | ○ | ● | distributor | ○ |
| Inventory and parts requirement | distributor | ○ | distributor | direct | ○ | ○ | distributor | distributor | ○ | ● | distributor | ○ |
| | | | | | | | BEST BUY | | | BEST BUY | | |

[1] Estimated.
[2] MPR Level I only.
[3] 24 months on the CRT.
[4] Next-day replacement via Federal Express.
[5] Next-day replacement via Federal Express at extra cost.

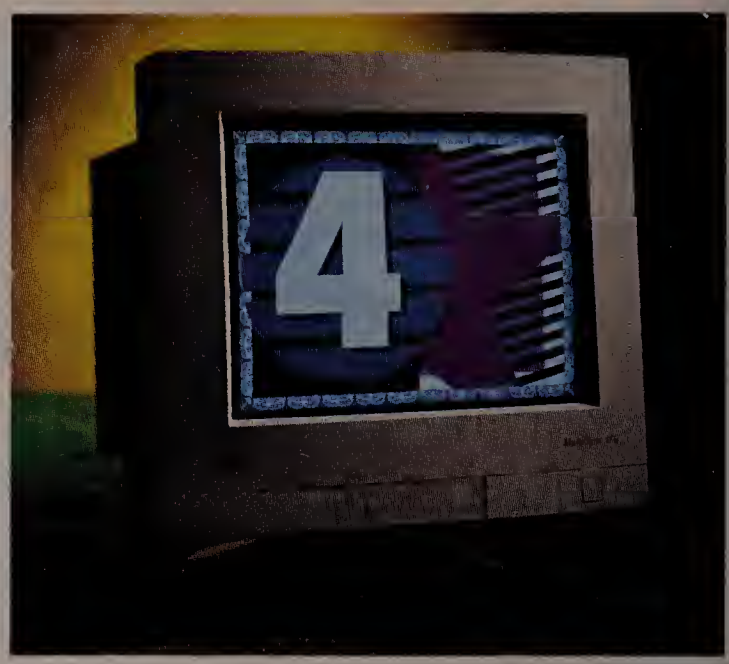
## NEC MultiSync 4FG

**PROS:** Low price, excellent sharpness, SWEDAC Level 2 compliance
**CONS:** Small screen

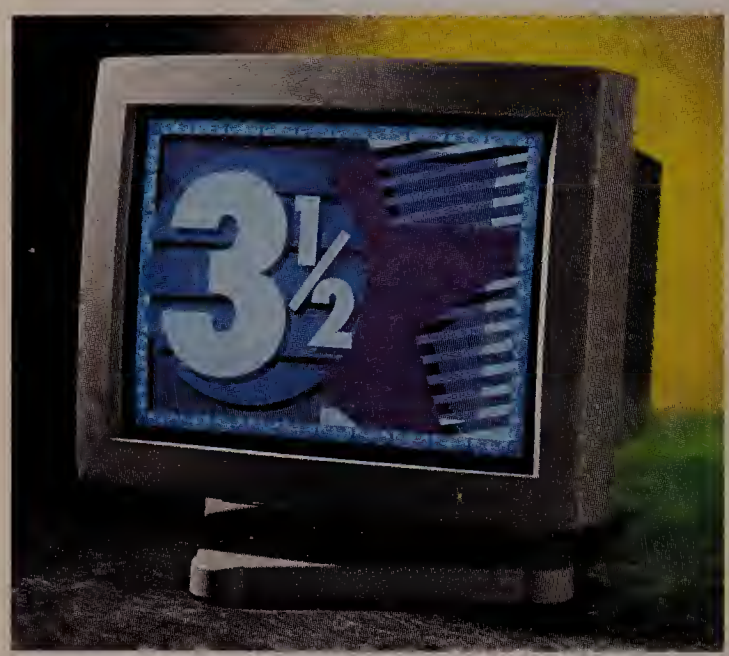
If you want the best bang for the buck, look no farther than the Best Buy NEC MultiSync 4FG. For just $825 (estimated street price) you get 85 square inches (15 diagonal inches) of super-crisp, flat-screen viewing. The monitor's slim profile meets the toughest space requirements, and it complies with SWEDAC's stringent Level 2 radiation standard.

Unique to the MultiSync 4FG is the ability to adjust screen colors, a boon to color printing. And if you don't like what you see, you can return to factory specs. For clarity's sake, NEC has left off any antiglare coating, so if a light causes problems, buy the optional glare filter ($79).

Turnaround time for repairs is a short 24 hours. The MultiSync 4FG has everything you could ask for: color adjustment, small footprint, SWEDAC compliance, and a low price. Don't miss this bargain.




**A generation ahead, the MultiSync 4FG offers a brilliant screen, the lowest emissions, and unique color controls.**




**The MultiVision has the largest viewing area of the 17-inchers and a long two-year warranty.**

## Taxan MultiVision 875

**PROS:** Large screen, overnight replacement
**CONS:** Heavy, poorly located controls

Taxan's MultiVision 875 is another challenger for the big-screen, heavyweight title. Weighing in at 51 pounds, this unit boasts a large 120-square-inch screen and good focus over most of the tube. The $1300 street price is right in there with the other 17-inchers.

All controls, including the power switch, are located on the right side of the monitor. This means you have to crane your neck to find the correct button, then (with your finger still on the button) swing back around to observe the adjustment.

The warranty is a long two years, and you can buy an insurance policy that guarantees overnight replacement should your monitor fail during the warranty period. The MultiVision 875 has what it takes to be a champ—and it could have been one, were the controls better located.

## ViewSonic 7

**PROS:** Large, well-focused screen
**CONS:** Big, heavy, seven-to-ten-day repair turnaround

The last of our big-screen heavyweights is the ViewSonic 7. Like the units from IOcomm, Mag, and Taxan, it gives you nice big characters on a large viewing area—and a hernia if you're not careful. Basically, the IOcomm CM-7128 and ViewSonic 7 are twins—a phenomenon you'll be seeing a lot more of as large-screen monitors proliferate. The estimated street price is $1200, about average for a 17-inch monitor.

The push-button screen controls are simple to operate. Don't forget to save your new settings, though, or they'll be lost when you switch off the monitor.

Turnaround time is a lengthy seven to ten days—bad news if it arrives DOA. Like its twin, the IOcomm CM-7128, this is a great monitor at a fair price. And choosing between the two would be a coin toss if not for the long turnaround time.

**A near twin of the IOcomm CM-7128, the ViewSonic has a big, attractive screen and conveniently located controls.**

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**Aamazing CM-1726X**
Aamazing Technologies
5980 Lakeshore Dr.
Cypress, CA 90630
714/826-9680,
714/826-9681 (fax)
LIST PRICE: $1599
WARRANTY: One year
TECHNICAL SUPPORT: 8½ hrs.
**Reader service no. 746**

**ADI 4A MicroScan**
ADI Systems Inc.
2121 Ringwood Ave.
San Jose, CA 95131
800/228-0538,
800/675-7322 (California)
LIST PRICE: $859
WARRANTY: Two years
TECHNICAL SUPPORT: 12 hrs.
**Reader service no. 747**

**CTX CPS-1760**
CTX Int'l
20530 Earlgate St.
Walnut, CA 91789
714/595-6146,
714/595-6293 (fax)
LIST PRICE: $1495
WARRANTY: One year, two years on the CRT
TECHNICAL SUPPORT: 12 hrs.
**Reader service no. 748**

**Dell GPD-16C**
Dell Computer
9505 Arboretum Blvd.
Austin, TX
78759-7299
800/289-3355,
512/338-8700 (fax)
LIST PRICE: $999
WARRANTY: One year
TECHNICAL SUPPORT: 15 hrs.
**Reader service no. 749**

**IOcomm CM-5128: ThinkSync 5**
**IOcomm CM-7128: ThinkSync 7M**
IOcomm Int'l Technology
12700 Yukon Ave.
Hawthorne, CA 90250
213/644-6100
LIST PRICE: $695 for CM-5128, $1995 for CM-7128
WARRANTY: One year
TECHNICAL SUPPORT: 9 hrs.
**Reader service no. 750**

**Mag MX15F**
**Mag MX17F**
Mag Innovision
4392 Corporate Center Dr.
Los Alamitos, CA 90720
800/827-3998,
714/827-3998
LIST PRICE: $1099 for MX15F, $1549 for MX17F
WARRANTY: One year, two years on the CRT
TECHNICAL SUPPORT: 9 hrs.
**Reader service no. 751**

**Nanao FlexScan 9080i**
Nanao USA
23535 Telo Ave.
Torrance, CA 90505
213/325-5202,
213/530-1679 (fax)
LIST PRICE: $1699
WARRANTY: One year
TECHNICAL SUPPORT: 10 hrs.
**Reader service no. 752**

**NEC MultiSync 4FG**
NEC Technologies
1255 Michael Dr.
Wood Dale, IL 60191
800/366-0476,
708/860-9500
LIST PRICE: $899, antiglare filter $79
WARRANTY: One year
TECHNICAL SUPPORT: 9½ hrs.
**Reader service no. 753**

**Taxan MultiVision 875**
Taxan America
161 Nortech Pkwy.
San Jose, CA 95134
800/648-2926,
408/263-4900
LIST PRICE: $1978
WARRANTY: Two years
TECHNICAL SUPPORT: 10 hrs.
**Reader service no. 754**

**ViewSonic 7**
ViewSonic
12130 Mora Dr.
Santa Fe Springs, CA 90670
800/888-8583,
213/946-1618 (fax)
LIST PRICE: $1999
WARRANTY: One year
TECHNICAL SUPPORT: 10 hrs.
**Reader service no. 755**


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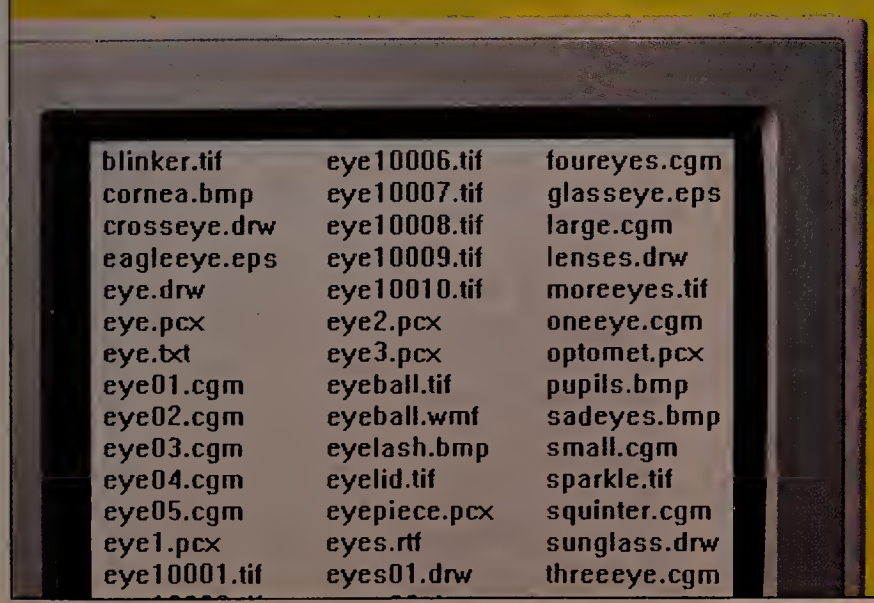
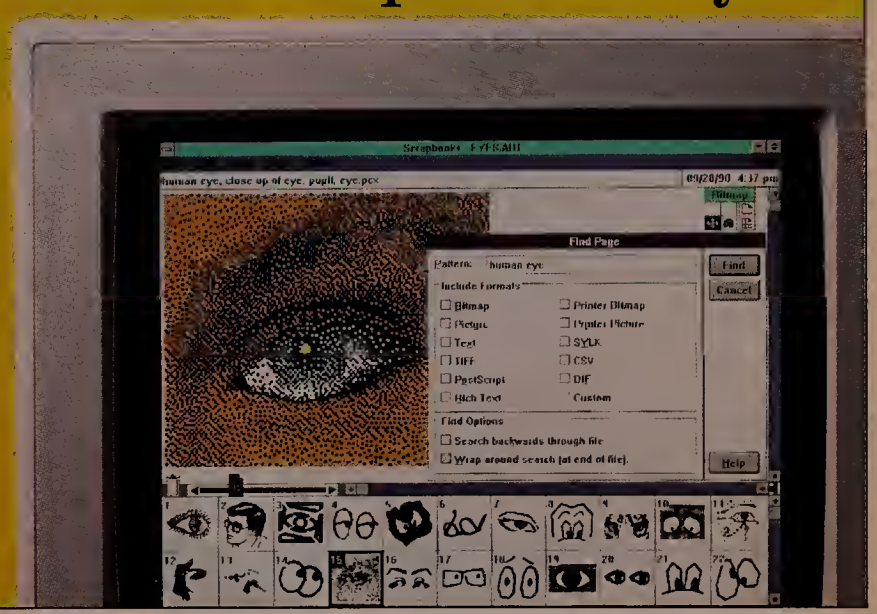



## The Scrapbook+ way.




**Circle 82 on reader service card**

## Big-Screen Monitors: Best of the Rest

| Model | List price | CRT size (diagonal inches) | Dot pitch (mm) | Microprocessor controlled | Dimensions (inches)[1] | SWEDAC compliance | Warranty (months) |
|---|---|---|---|---|---|---|---|
| Acer AcerView 76 | $1199 | 17 | 0.31 | Y | 16.8 x 16.6 x 18.1 | N | 12 |
| Addonics MON-C171 | $1395 | 17 | 0.31 | N | 15.9 x 17.2 x 16.3 | N | 12 |
| Addonics MON-C151 | $1095 | 15 | 0.28 | N | 14.3 x 14.8 x 15 | N | 12 |
| Hewlett-Packard HP D1188A | $2795 | 16 | 0.28 | N | 14 x 15.8 x 17.9 | N | 12 |
| NEC MultiSync 5FG | $1599 | 17 | 0.28 | Y | 16.4 x 17.8 x 19.8 | Y | 24[2] |
| Princeton Ultra 1700 | $1699 | 17 | 0.26 | Y | 15.5 x 15.8 x 17 | N | 12 |
| Qume QM870 | $1495 | 17 | 0.26 | Y | 16.3 x 16.3 x 16.4 | N[3] | 12 |
| Relisys RE1776 | $1495 | 17 | 0.26 | N | 22.5 x 22 x 22.5 | N | 12 |
| Sampo AlphaScan 17 | $1395 | 17 | 0.28 | Y | 16.3 x 15.9 x 17.2 | Y | 12 |
| Sony CPD-1604S | $1699 | 17 | 0.25 | N | 15.9 x 16.8 x 17.3 | Y | 12 |
| Tatung CM-17MBD | $1799 | 17 | 0.26 | Y | 14.9 x 16.2 x 18.9 | N | 12 |
| TVM MediaScan 6A | $1395 | 17 | 0.26 | Y | 15.7 x 16.4 x 17 | N | 12 |

[1] Height by width by depth. [2] 24 months parts, 12 months labor. [3] Extra-cost option.

### WHERE TO BUY

**Acer America**
408/922-0333
**Reader service no. 864**

**Addonics**
408/944-0393
**Reader service no. 865**

**Hewlett-Packard**
800/752-0900
**Reader service no. 866**

**NEC Technologies**
708/860-9500
**Reader service no. 867**

**Princeton Graphics Systems**
800/221-1490,
404/664-4103 (fax)
**Reader service no. 868**

**Qume**
800/457-4447,
408/942-4052 (fax)
**Reader service no. 869**

**Relisys**
408/945-9000
**Reader service no. 870**

**Sampo America**
404/449-6220,
404/447-1109 (fax)
**Reader service no. 871**

**Sony**
800/222-0878
**Reader service no. 872**

**Tatung**
800/827-2850,
213/637-8484 (fax)
**Reader service no. 873**

**TVM Professional Monitor Corp.**
714/985-4788,
714/985-8377 (fax)
**Reader service no. 874**

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## Monitor Emissions: Hazard or Hype?

Cigarettes, fatty foods, monitor emissions...all pose a hazard to your health. Or do they? While the harmful effects of nicotine and saturated fats are well documented, *conclusive* evidence has yet to emerge about electromagnetic emissions from monitors.

Still, inconclusive evidence abounds. Since 1977, studies have linked high cancer rates to electromagnetic fields from power lines and other sources; in 1982, a Canadian study implicated monitors as another potentially dangerous source. A Kaiser Permanente study of 1583 women, published in 1988, suggested that those who spent more than 20 hours a week in front of a VDT had an 80 percent higher risk of miscarriage than those who performed similar work without computers.

Critics argue that in such studies it's difficult to separate the possible effects of emissions from those of stress and other factors. Nonetheless, many of us would prefer not to wait until the experts decide on the quality of the evidence.

The Swedish Board for Technical Accreditation (SWEDAC) has taken bold preemptive action in setting limits on monitor emissions. SWEDAC's two standards, MPR 1 and MPR 2, specify maximum values for both alternating electric fields and magnetic fields and provide monitor manufacturers with useful guidelines in creating low-emission monitors.

Until recently, low-emission displays have been almost exclusively monochrome. This roundup features two new low-emission color monitors: the Nanao FlexScan 9080i and NEC's MultiSync 4FG. The FlexScan complies with the Level 1 guidelines, while the MultiSync 4FG complies with the far more stringent Level 2 guidelines.

Even a monitor compatible with the Level 2 standard isn't necessarily "safe." No one, including SWEDAC, claims to have established safe limits for emissions—especially when definitive proof of harm is elusive. But then, we weren't so sure about nicotine 30 years ago. Buying a low-emission monitor costs little more than buying an ordinary one. If you'd rather be safe than sorry, consider the FlexScan or the MultiSync—or any of the other low-emission competitors that should arrive soon.

| | AcerView 35 | AcerView 25 | AcerView 33 | AcerView 33LR | AcerView 31 | AcerView 11 |
|---|---|---|---|---|---|---|
| Screen | 14" 0.26mm Sony Trinitron | 14" 0.28mm | 14" 0.28mm | 14" 0.28mm/Very Low Radiation | 14" 0.28mm | 14" 0.39mm |
| Resolution | 640 x 480<br>800 x 600 72Hz refresh rate<br>1024 x 768 non-interlaced 60Hz refresh rate | 640 x 480<br>800 x 600 72Hz refresh rate<br>1024 x 768 non-interlaced 70Hz refresh rate | 640 x 480<br>800 x 600 60Hz refresh rate<br>1024 x 768 interlaced | 640 x 480<br>800 x 600 60Hz refresh rate<br>1024 x 768 interlaced | 640 x 480 | 640 x 480 |
| Horizontal Scan | 31KHz-55KHz | 31KHz-60KHz | 31KHz-38KHz | 31KHz-38KHz | 31.5KHz | 31.5KHz |
| Compatibility | UltraVGA, VGA, XGA, 8514/A | UltraVGA, VGA, XGA, 8514/A | SuperVGA, VGA, XGA, 8514/A | SuperVGA, VGA, XGA, 8514/A | VGA | VGA |
| MSRP* | $899 | $799 | $599 | $669 | $529 | $399 |

MSRP* Based on September 1, 1991 and subject to change.

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▣Adobe TypeSets for Business..... ea. 95.
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7928 ▣Adobe Plus Pack 1.0..... 129.
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9621 ▣Picture Eze 1.0 for Windows..... 99.

**Artisoft ... NCP**
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**Avery Dennison ... NCP**
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7336 ▣Label Pro 1.0 for Dot Matrix..... 49.
1600 Avery 1st Impression..... 229.

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▣Typeface Packages..... *each* 89.

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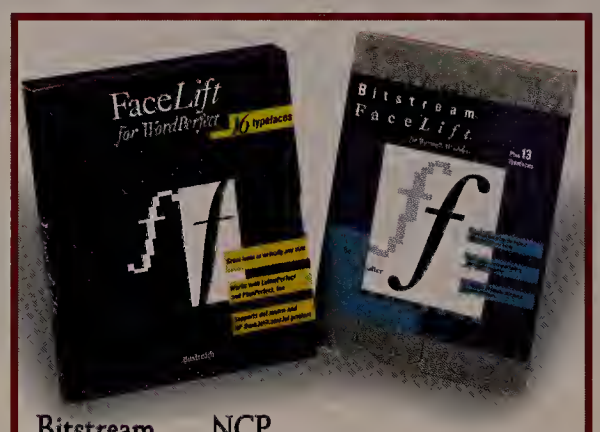


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**Corel Systems ... NCP**
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**Data Storm ... NCP**
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**Delrina Technology ... NCP**
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**Individual Software ... NCP**
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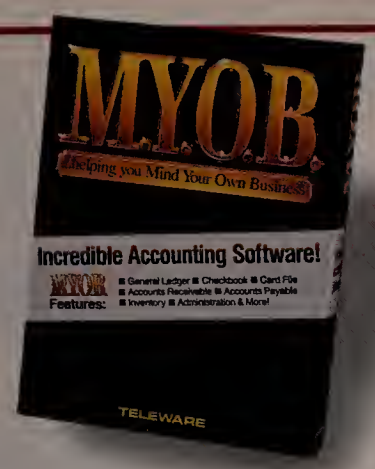
# of crowded malls?

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1620 ☐ DOS 5.0 Upgrade ..... 65.
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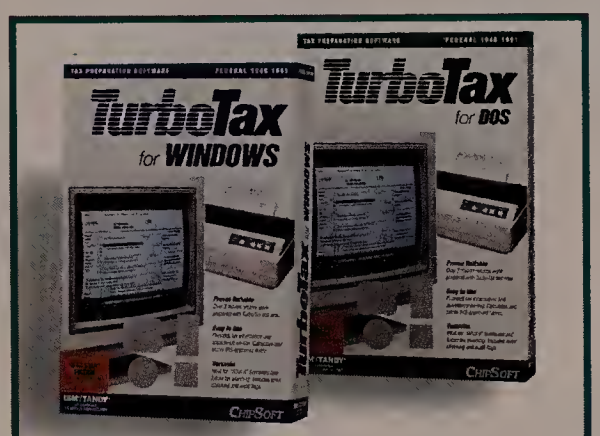


**Chipsoft ... NCP**
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**Norton-Lambert ... NCP**
2753 ☐ CloseUp for Windows & DOS Dual Pack 129.

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9878 ◉ ReadRight 3.0 for Windows ..... 309.

**Okna ... NCP**
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5900 ◉ PC USA 2.0 ..... 45.

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9638 ☐ Professional Write Plus 1.0 ..... 169.
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**Spinnaker ... NCP**
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7604 ◉ PLUS for Windows 2.0 ..... 289.

**Stac Electronics ... NCP**
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**Symantec ... NCP**
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3146 ◉ The Norton Utilities 6.0 ..... 119.
3425 ☐ Q&A 4.0 ..... 269.

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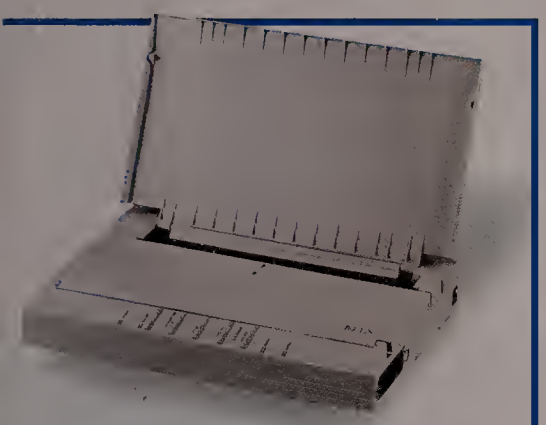

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0 80387SX-20 *(20 MHz 80386SX CPU's)* . 145.
9 80387-33 *(80386DX CPU's)* ..... 219.

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1196 T224 2400 Modem *(for Toshiba Laptops)* 129.
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**Micron Technology ... 2 years**
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7012 Memory Upgrade PS/2 70 - 2 MB .... 139.

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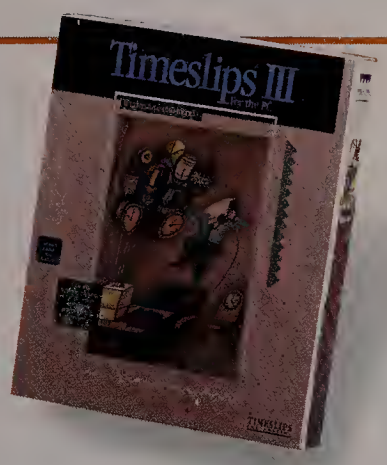


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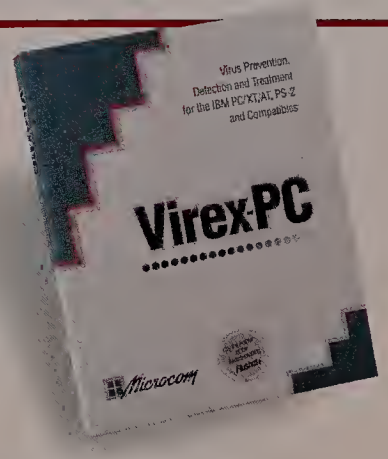
6834 Pacific Page *(for LJ II)* w/2 MB Mem. Brd. 379.
9833 Pacific Page XL *(w/accelerator board)* .. 799.

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| 8993 | 2400 Baud Internal Modem *(V.42 bis)* | 169. |
| 8994 | 2400 Baud External Modem *(V.42 bis)* | 199. |
| 4542 | 2400 Baud Internal Modem for PS/2 | 229. |
| 8132 | PM2400 Pocket Modem | 109. |
| 2266 | PM9600 Internal Modem | 399. |
| 7934 | PM9600SA Modem | 469. |
| 2264 | PM2400FX96 *(modem/fax board)* | 145. |

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| 3359 | T2000SX Notebook *(60 MB)* | 3299. |
| 3360 | T2000SXE Notebook *(40 MB)* | 3399. |
| 3361 | T2000SXE Notebook *(60 MB)* | 3649. |
| 1779 | T3100SX Laptop *(80 MB)* | 3199. |
| 1773 | T3200SX Laptop *(120 MB)* | 3499. |

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| 6200 | Isobar 6-6 *(6 outlets, Gold Seal Warranty)* | 59. |
| 6201 | Isobar 8-12 *(8 outlets, Gold Seal Warranty)* | 69. |
| 6018 | LC1200 *(1200W line conditioner)* | 159. |
| 1528 | PS6.0 *(600VA on-line UPS)* | 559. |

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| 1170 | 2400 Baud w/4800 Baud sendfax | 69. |
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| 1167 | 2400 Baud Internal Modem | 65. |
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| 2339 | CP30104 120 MB IDE HD *(19 ms)* | 399. |
| 1337 | CP3204 200 MB IDE HD *(16 ms)* | 629. |

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| 2224 | Bernoulli II Transportable 90 MB | 799. |
| 2616 | Internal 90 MB Bernoulli | 799. |
| 2500 | PC2B Controller | 199. |
| 2530 | 90 MB Cartridge | 149. |
| 2467 | 90 MB Cartridge Tripak | 439. |

**Mountain Network Solutions ... 2 years**

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|---|---|---|
| 2917 | 40-60 MB Internal Tape Drive | 259. |
| 5190 | DC2000 Pre-formatted Cartridges ... ea. | 35. |
| 6153 | DC2120 Tape Cartridge *(5 pack)* | 149. |

**Pacific Rim ... 1 year**

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| 1304 | 1.2 MB External *(for any parallel port)* | 239. |
| 6602 | 1.44 MB External *(for PC/XT/AT)* | 239. |

**Plus Development ... 2 years**

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| 8304 | Hardcard II XL 50 MB *(9 ms)* | $399. |
| 8287 | Hardcard II XL 105 MB *(9 ms)* | 599. |

**Seagate ... 1 year**

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|---|---|---|
| 4554 | 40 MB Internal HD ST251-1 *(28 ms)* | 249. |
| 1321 | ST157A 40 MB IDE Hard Drive | 229. |
| 1320 | ST1144A 130 MB IDE Hard Drive | 459. |

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| 4670 | 1.44 MB Drive for PC/XT *(3½")* | 69. |
| 4326 | 1.44 MB Drive for AT *(3½", w/Basetech)* | 89. |
| 4951 | 720k Drive for PC/XT *(3½")* | 69. |
| 6951 | 1.2 MB Drive for AT *(5¼")* | 75. |

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| 6556 | 256k DRAM *(100 ns, set of 9)* | call |
| 5510 | 1 MB x 9 SIMMs *(80 nanosecond)* | call |
| 2497 | 4 MB x 9 SIMMs *(80 nanosecond)* | call |
| 5746 | 1 MB Chips *(80 ns, set of 9)* | call |
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3860 *2400 External Modem* ..... $109.

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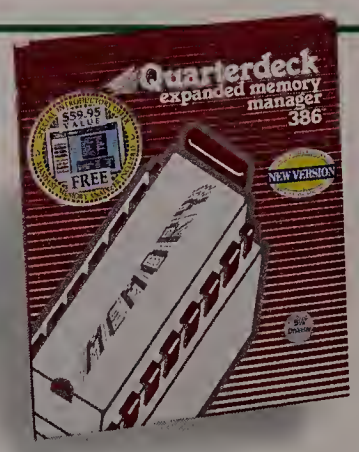


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3221 ☐*Expanded Memory Manager 386 6.0*—Gain up to 200K or more of previously unusable memory. Incl. automatic memory conversion, full compatibility with Windows, & speed optimization of memory (w/Manifest). . $65.

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|---|---|---|
| 3291 | 5¼" DS/DD 360k Disks *(Qty. 10)* | 8. |
| 3297 | 3½" DS/DD 720k Diskettes *(Qty. 10)* | 11. |
| 3298 | 3½" DS/HD 1.44 MB Diskettes *(Qty. 10)* | 18. |
| 6148 | 3½" DS/DD *(3 Pack)* | 29. |
| 6375 | 3½" DS/HD *(3 Pack)* | $49. |
| 8185 | QD2040 Tape Cartridge | 19. |
| 1895 | QD2120 Tape Cartridge | 22. |
| 6715 | QD6150 Tape Cartridge | 27. |

**3M ... lifetime**

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|---|---|---|
| 3943 | DC 2000 Tape Cartridge | 19. |
| 6065 | DC 2080 Tape Cartridge | 25. |
| 3944 | DC 600 Tape Cartridge | 29. |
| 5679 | DC 6150 Tape Cartridge | 29. |

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9847 ⊡M.Y.O.B. for Windows..... 139.

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1270 ☐TimeSheet Pro 2.0 ..... 135.

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6253 ⊡Publish-It! 2.0 ..... 159.

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3863 WinTools for Windows 1.0 *(3½" only)*... 125.

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**Traveling Software ... NCP**
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7796 ⊡Publisher V 4.0 for Windows..... 569.

**WordPerfect Corporation ... NCP**
7781 ⊡LetterPerfect 1.0..... 129.
4214 ⊡WordPerfect Office PC ..... 89.
3804 ☐WordPerfect 5.1 ..... 265.

**WordStar International ... NCP**
1482 ⊡Correct Grammar 1.0 for Windows .... 65.
6791 ☐WordStar Professional 6.0..... 199.

**XTREE ... NCP**
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**Z-Soft ... NCP**
1626 ⊡Publisher's Paintbrush for Windows .. 299.

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1836 ⊡Where in America's Past is Carmen Sandiego ..... 39.
5851 ⊡SimCity..... 33.
8886 ⊡SimEarth..... 45.

**Electronic Arts ... NCP**
4534 ⊡Mavis Beacon Teaches Typing 2.0 *(CP)* 35.
3031 ⊡Mavis Beacon for Windows..... 45.
3023 ⊡ChessMaster 3000..... 35.
7865 ☐PGA Golf ..... 35.
1334 ☐Chuck Yeager Air Combat Trainer..... 42.
7372 ⊡World Atlas 2.0..... 42.
3050 ☐World Atlas for Windows..... 57.

**Harvard Associates ... NCP**
2324 ⊡PC Logo 3.0..... 59.

**HyperGlot Software ... NCP**
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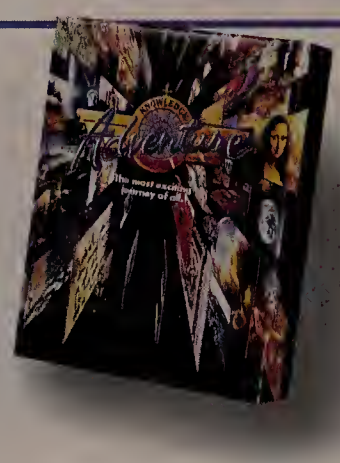
☐Word Torture for Windows ..... ea. 34.
☐Word Torture 3.0 ..... ea. 29.

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**Microsoft ... NCP**
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2858 ☐Flight Simulator 4.0..... 39.
8270 ⊡Aircraft and Scenery Designer 1.0 .... 29.

**Microsoft Press (Books)**
8129 Running Windows *(2nd Edition)*..... 22.

**Penton Overseas ... NCP**
⊡VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese) ..... *each* 35.

**Sierra ... CP**
2767 ☐Leisure Suit Larry V *(VGA)*..... 39.
9466 ☐Space Quest IV *(VGA)*..... 39.
7972 ☐King's Quest V *(VGA)* ..... 45.

**Software Toolworks ... NCP**
3294 ⊡Game Pak *(5 games in one)* ..... 32.
9860 ⊡Word for Word Professional 4.2..... 89.

**Spectrum Holobyte ... NCP**
3047 ⊡Wordtris ..... 27.
3457 ☐Falcon 3.0 ..... 45.

**Stone & Associates ... NCP**
3435 ⊡Letters, Numbers, Words ..... 22.
3439 ⊡2nd Math 4.2 ..... 27.

**Toyogo ... NCP**
2701 ⊡Go Master 5.0 for Windows..... 39.
2703 ⊡Nemesis Deluxe Toolkit 5.0..... 75.
2704 ⊡Nemesis Deluxe Toolkit 5.0 for Windows. 75.

**True BASIC, Inc. ... NCP**
⊡Kemeny/Kurtz Math Series ..... *each* 45.

**Practical Peripherals ... 5 years**
2264 *PM2400FX96 Fax Modem*—2400 bps internal modem with true 9600 bps send/receive capabilities. A Hayes compatible 1/2 card, it also allows you to receive faxes in the background, & includes QuickLink II.. $145.

**Walt Disney Computer Software ... CP**
2629 ⊡Mickey's 123's ..... 35.
2624 ⊡Mickey's ABC's ..... 35.

## HARDWARE

**Warranties listed next to manufacturer.**

**American Power ... 2 years**
7108 Smart UPS 400 ..... 339.
7105 Smart UPS 600 ..... 469.
6811 Back-UPS 360 ..... 185.
7106 Back-UPS 520..... 299.

**ATI Technologies ... 2 years**
9821 VGA Basic-16 *(640 x 480, 16 colors)*..... 69.
2706 VGA Wonder XL *(w/1 MB)* ..... ... 239.
9985 VGA Integra *(1024 x 768, 16 colors)* ..... 95.
2382 *Graphics Vantage VGA (w/1 MB)* ..... 359.
9822 Graphics Ultra *(w/1 MB)*..... 559.
2012 Graphics Ultra w/VGA *(w/1 MB)* ..... 619.
1825 2400etc/i Modem *(w/9600 SendFax)* ... 139.
9620 9600etc/e Modem ..... 379.
3080 Stereo•F/X..... 149.
3076 VGA Stereo•F/X *(w/512K, upgrd. to 1 MB)* 329.

**Boca Research ... 5 years**
7001 BOCARAM/AT PLUS *(0K)*..... 119.
7150 BOCARAM/AT PLUS *(2 MB)*..... 219.
7139 *(4 MB)* .... 329. 7138 *(8 MB)* .... 539.
6998 I/O Board for AT ..... 55.
6999 I/O Board for Microchannel *(S/S/P)*..... 109.
8380 BasicVGA *(256K, 640 x 480)* ..... 63.
8381 SuperVGA *(1 MB, 1024 x 768)* ..... 145.
3859 2400 Internal Modem..... 85.
3860 2400 External Modem ..... 109.

**Bravo Communications ... 2 years**
7400 2 Position Laser Compatible Switch Box. 109.

**Brown-Wagh ... 1 year**
8578 Creative Labs Sound Blaster..... 115.
2336 Creative Labs Sound Blaster Pro ..... 189.

**Caere ... 1 year**
8158 Typist Plus Graphics..... 389.

**Canon ... 1 year**
*We are an authorized Canon Service Center.*
7894 BJ-10ex Printer *(4.6 lb.)* ..... 339.
7897 BubbleJet Ink Cartridge *(BJ-10ex)* ..... 23.
7896 BJ-10ex Sheet Feeder ..... 75.

**Cardinal ... 1 year**
2720 MB2450 Internal 2400 Baud Modem.... 69.
2719 MB2296SR Internal Send/Receive Fax.. 109.
2721 VGA732 True Color Ultra VGA Card .... 185.

**CH Products ... 1 year**
7801 FlightStick w/Falcon..... 49.

**CoStar ... 1 year**
1418 AddressWriter Envelope Printer ..... 499.

**Curtis ... lifetime**
1708 Ruby-Plus SPF-2+ ..... 65.
7358 Command Center SPF-4 ..... 89.
Glass Filter Plus *(specify size)*..... *each* 65.

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It's time to preserve, pickle, and pack it in for the season up here in the glorified pumpkin patch of Marlow, NH (pop. 567). But even though there's a definite nip in the air, and we're tucking ourselves in tighter each night, we continue offering the freshest crop of PC products you'll find anywhere—not to mention service that's way more personal than any computer will ever be.

Our illustrious party animals have been adding a human touch to high tech for almost ten years now. But for newcomers it may be a little hard to see the Connection, so to speak. Well, it's simple—while we do have the best combination of low prices, technical support, and fast shipping around, we're still just a bunch of country folk doing an honest day's (and often night's) work here in the woods of New Hampshire. Call anytime—whether you want the latest video display or a report on this year's apple crop.

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Things will really start hopping around your office when you get your supply of PC Connection Popcorn on the Cob. We're sending some free to everyone who places an order for $750 or more between now and December 31. Just put a cob in the bag, place it in your microwave, and out come three cups of popcorn. What an earful!

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# TAPE

Data is your most valuable asset. Choose one of these 14 units, and you can back up an entire 120MB disk with the press of a key.

# BACKUPS

PIERRE-YVES GOAVEC

It takes just one brush with hard disk disaster to convince you to back up your data: Nobody wants to be stuck repeating long hours of work or trying to explain the loss of important records to the boss or clients. But for most business users, it's no longer practical to back up a work PC using floppy disks. Today's graphics-intensive business applications require 100MB or larger hard disks, so even with an average 2-to-1 compression ratio and 1.44MB floppy disks, you'd have to shuffle 35 or more disks for every full backup!

Affordable large-capacity tape drives provide the most sensible way to back up data and safeguard your applications. You can launch a backup as you leave the office and find your entire hard disk safely backed up the next morning.

What kind of tape drive do you need to back up today's business PC? You want to fit every megabyte of data from your hard disk onto a single tape. Otherwise, you'll have to babysit the drive, waiting to insert another data cassette. Your tape drive should also be compatible with other tape drives in the office. If PCs get moved around and you get a new working machine, you'll want to be able to restore your application setup and data from the backup tape you made on your old PC. And you never know when you may have to restore a record from a co-worker's backup.

## WHICH TAPE STANDARD FOR YOU?

Low drive and media cost convinces most users to buy QIC-40, QIC-80, or Irwin proprietary Servo-format drives. All these drives use quarter-inch minicartridges from the DC2000 family. QIC-40 and Irwin 40MB drives still top the sales charts, but they hold only 40MB of uncompressed data on a standard-length tape and 60MB on an extended-length tape. For today's larger hard disks, the doubled capacities of QIC-80 and 80MB/120MB Irwins are much more practical. You can find QIC-80 drives with street prices as low as $300, and they'll read tapes from a QIC-40 drive you may already own.

ART WILCOX

## 80MB/120MB TAPE DRIVES

| Company | Product | List price | Warranty (months) | Specifications: Formatted capacity (MB) | Capacity with compression (MB) | Formot tape an the fly | Preformatted tape ovoiloble | Tope included | Works with floppy controller | High-speed controller |
|---|---|---|---|---|---|---|---|---|---|---|
| ALLOY COMPUTER PRODUCTS | Retriever 250C | $525 | 12 | 80/120 | 250 | N | Y | Y | Y | N |
| BACKTRAX | Phantom 250 | $379 | 18 | 80/124 | 250 | N | Y | Y | Y | N |
| COLORADO MEMORY SYSTEMS | Jumbo 250 | $500 | 12 | 80/120 | 250 | N | Y | N | Y | Y[1] |
| CORE INT'L | Coretape Light | $590 | 18 | 80/120 | 300 | N | Y | Y | Y | N |
| EVEREX SYSTEMS | Excel 120F | $359 | 24 | 80/120 | 240 | N | Y | N | Y | N |
| IRWIN MAGNETIC SYSTEMS | AccuTrak Standard 250 | $359 | 12 | 80/120 | 250 | N | Y | N | Y | N |
| | AccuTrak Plus 250 | $479 | 12 | 80/120 | 250 | N | Y | Y | N | Y |
| MAYNARD ELECTRONICS | ArchiveXL 5580i | $499 | 12 | 80/120 | 250 | Y | Y | Y | Y | N |
| MOUNTAIN NETWORK SOLUTIONS | FileSafe 8000Plus | $795 | 24 | 80/124 | 250 | N | Y | Y | Y | Y[1] |
| | FileSafe 8000Plus Mach2 | $995 | 24 | 80/124/152 | 304 | Y | Y | Y | N | Y |
| TALLGRASS TECHNOLOGIES | FS250 | $575 | 24 | 80/120 | 250 | N | N | Y | Y | N |
| | FS300 | $995 | 24 | 80/120/150 | 300 | N | N | Y | N | Y |
| TECMAR | MiniVault 250 | $519 | 24 | 80/120 | 250 | N | Y | Y | Y | Y[1] |
| WANGTEK | Model 3080 | $599 | 12 | 80/120 | 250 | N | N | Y | Y | Y[1] |

[1] Extro-cost option.

The popular Irwin drives, although not compatible with the QIC-80 standard, use the same DC2080 (80MB) and DC2120 (120MB) media and provide similar capacities at a similar price. And they're sold widely with systems, particularly Compaqs and IBMs. So if you already have 40MB/60MB Irwin drives in your office, an 80MB/120MB Irwin drive is probably your best choice because you'll still be able to read Irwin's Servo-format 40MB tapes.

Each drive listed here comes with menu-driven backup software, but the QIC-80 standard gives you other options as well. Both the powerful *Central Point Backup 7.0* and Sytron's *Sytos Plus 1.3* can back up to both floppies and tape and provide full QIC-40/80 support. The popular *Fastback Plus* and *Norton Backup* floppy-based programs also promise QIC-40/80 support soon (see "No-Sweat Backup Software," July 1991).

With a program that handles floppy and tape backups, your entire staff can use the same software, whether they're backing up big disks with tape or small ones with floppies. You should be able to use *Central Point Backup 7.0* or *Sytos Plus 1.3* with all drives in this guide except the Backtrax, Everex, and Irwins, which require their own software. Happily for *Windows* fans, *Central Point Backup 7.0* comes with *Windows* versions; Irwin has just added a $60 *Windows* upgrade to its *EzTape;* and Colorado Memory Systems has a $49 *Windows* upgrade.

Drives recognizable as a DOS device can be assigned a drive letter. You can then back up to them with any floppy-based package, but you'll sacrifice both speed and function.

### CAPACITY AND FORMATTING

Each drive's backup program provides data compression, which on the average can double storage capacity. Software compression slows your backup, but that's a small price to pay for the increased capacity you'll gain. Mountain Network Solutions and Tallgrass Technologies increase tape capacity another 25 percent on some of their drives by offering proprietary formatting schemes that store 150MB of uncompressed data on a DC2120 tape or up to 300MB using compression. If you use this extra-capacity backup mode, however, other QIC-80 drives won't be able to read your tapes.

You have to format a tape before it can store data. The Maynard Archive XL 5580i and the Mountain FileSafe 8000Plus Mach2 let you format your tape on the fly during the backup process, sparing you the separate, time-consuming formatting process that can tie up your computer for as long as 3 hours. Fortunately, most vendors sell preformatted tapes that let you avoid this inconvenience. If you order preformatted tapes from someone other than your drive vendor, make sure you're buying the tape that works with your drive.

### CONTROLLERS AND BAYS

Most QIC-80 drives can run from your system's existing floppy controller, so unless your controller is already supporting its limit, you won't need to give up an expansion slot. If your floppy controller is driving all the devices it can handle, however, you'll need to purchase a floppy interface card along with your backup drive.

Several vendors offer high-speed interface cards that can effectively double the speed of a floppy controller—helpful if you need to back up during the workday. For an extra $299, Colorado Memory Systems offers a compression controller that lets you back up with no loss in speed.

If you own a PS/2 or any

| Floppy controller available from manufacturer | Fits in 3½-inch bay | PS/2 version available | MTBF (thousands of hours) | Bundled software: Bundled software | Password protection | Backup/restore multiple disks and partitions | Supports QFA (quick file access) | Backup/restore by archive bit | Recognized as DOS device | Reader service number |
|---|---|---|---|---|---|---|---|---|---|---|
| Y | N | Y | 30 | ResQ120 | Y | Y | N | Y | N | 725 |
| Y | Y | N | 20 | BackTrax | Y | Y | N | N | Y | 726 |
| Y | Y | Y | 10 | Jumbo for DOS | Y | Y | N | Y | N | 727 |
| Y | Y | Y | 25 | Coretape Light 2.0 | Y | Y | Y | Y | Y | 728 |
| Y | Y | Y | 10 | Everex FTape 3.0 | Y | Y | N | Y | Y | 729 |
| N | N | Y | 50 | EzTape 2.22 | Y | Y | N | Y | N | 730 |
| N | N | Y | 50 | EzTape 2.22, EzTape 3.0 for Windows | Y | Y | N | Y | N | 730 |
| Y | Y | Y | 30 | QICStream 2.0 | Y | N | N | Y | N | 731 |
| Y | N | Y | 12 | FileSafe Tape Software 5.2.3 | Y | Y | Y | Y | N | 732 |
| N | N | Y | 12 | FileSafe Tape Software 5.2.3 | Y | Y | Y | Y | N | 732 |
| Y | Y | Y | 12 | FileSecure 1.5x | Y | Y | N | Y | N | 733 |
| N | Y | Y | 12 | FileSecure 1.5x | Y | Y | N | Y | N | 733 |
| Y | Y | N | 24 | MiniVault Software | N | Y | Y | Y | N | 734 |
| Y | Y | N | 40 | Central Point Backup 7.0 | Y | Y | Y | Y | N | 735 |

**For more information about all products in this table, circle reader service no. 904**

system that offers only a 3½-inch storage bay, you'll need a drive that fills the bill. All the drives listed here fit in a standard half-height 5¼-inch bay, but only about a third will fit in a 3½-inch bay. In addition, PS/2 owners need to purchase a drive that supports their specific model.

A drive has to be durable, so check the mean time between failures as a rough gauge of overall dependability. But remember that the times listed in the table are based on vendors' claims and have not been tested by *PC World*. Ultimately, the length of the warranty is more important.

## SOFTWARE: TAMING TAPE

Each bundled backup program lets you back up selected files or subdirectories. And all include error correction, data compression, and an overwrite warning to prevent accidental loss of existing backup sets or files.

If you have multiple hard drives or partitions, you'll want your software to back them up in a single session. To save more time, some backup programs support quick file access (QFA), which locates files without first reading every file on the tape—great when you're restoring only a few files. Finally, if your program lets you back up by archive bit, it will automatically back up only those files that have changed since the last backup.

## BACKING UP TO THE FUTURE

Depending on what you already have, you will be safe if you stick with QIC or go with Irwin's proprietary format. Adhering to one of these proven standards allows you to read yesterday's tapes and protects your upgrade path. But whichever way you go, installing and using the right tape drive will help you to preserve your data—and your peace of mind.

## WHERE TO BUY

**Alloy Computer Products, Inc.**
1 Brigham St.
Marlborough, MA 01752
800/800-2556, 508/481-8500 (fax)

**BackTrax**
21800 Oxnard St. #700
Woodland Hills, CA 91367
800/669-3506, 818/340-3994 (fax)

**Central Point Software**
15220 N.W. Greenbrier Pkwy. #200
Beaverton, OR 97006
800/445-4208, 503/690-8088

**Colorado Memory Systems**
800 S. Taft Ave.
Loveland, CO 80537
800/845-7905, 303/669-8000

**Core Int'l**
7171 N. Federal Hwy.
Boca Raton, FL 33487
407/997-6055, 407/997-6009 (fax)

**Everex Systems**
48431 Milmont Dr.
Fremont, CA 94538
800/628-3837, 510/498-1111

**Irwin Magnetic Systems**
2101 Commonwealth Blvd.
Ann Arbor, MI 48105
800/421-1879, 313/930-9000

**Maynard Electronics, Inc.**
36 Skyline Dr.
Lake Mary, FL 32746
800/821-8782, 407/263-3555 (fax)

**Mountain Network Solutions**
240 Hacienda Ave.
Campbell, CA 95008
800/458-0300, 408/379-4300

**Sytron Corp.**
134 Flanders Rd.
Westborough, MA 01581
508/898-0100, 508/898-2677 (fax)

**Tallgrass Technologies**
11100 W. 82nd St.
Lenexa, KS 66214
800/736-6002, 913/492-6002

**Tecmar**
6225 Cochran Rd.
Solon, OH 44139
800/624-8560, 216/349-0600

**Wangtek**
41 Moreland Rd.
Simi Valley, CA 93065
800/992-9916, 805/583-5255 (fax)

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You'd be surprised where the new HP ScanJet IIc scanner can take you.

Our improved 8-bit grayscale brings you black & white that you once only dreamed of. And our new 24-bit color helps give your output magical impact. Both come with true 400 dpi quality.

Our new HP AccuPage technology combined with your OCR software makes text scanning better than ever. And with our automatic document feeder, you can scan up to 50 pages in quick succession.

When it comes to scanning color, the ScanJet IIc only

*The HP ScanJet IIc makes it easier than ever to create a great image.*

*Suggested U.S. list price. © 1991 Hewlett-Packard Company PE 12121
†In Canada, call 1-800-387-3867, Ext. 2548.

# The new HP ScanJet IIc opens up a whole new world. With better black & white. And color.

needs to make one pass. So you scan color images faster than you can click your heels three times.

Of course, the ScanJet IIc is compatible with all major software. And it's only $2,195* for IBM AT-compatible and Micro Channel. Or only $1,995* for Macintosh.

For the nearest authorized HP dealer or for more information, call 1-800-752-0900, Ext. 2548.† You'll experience awes like never before.

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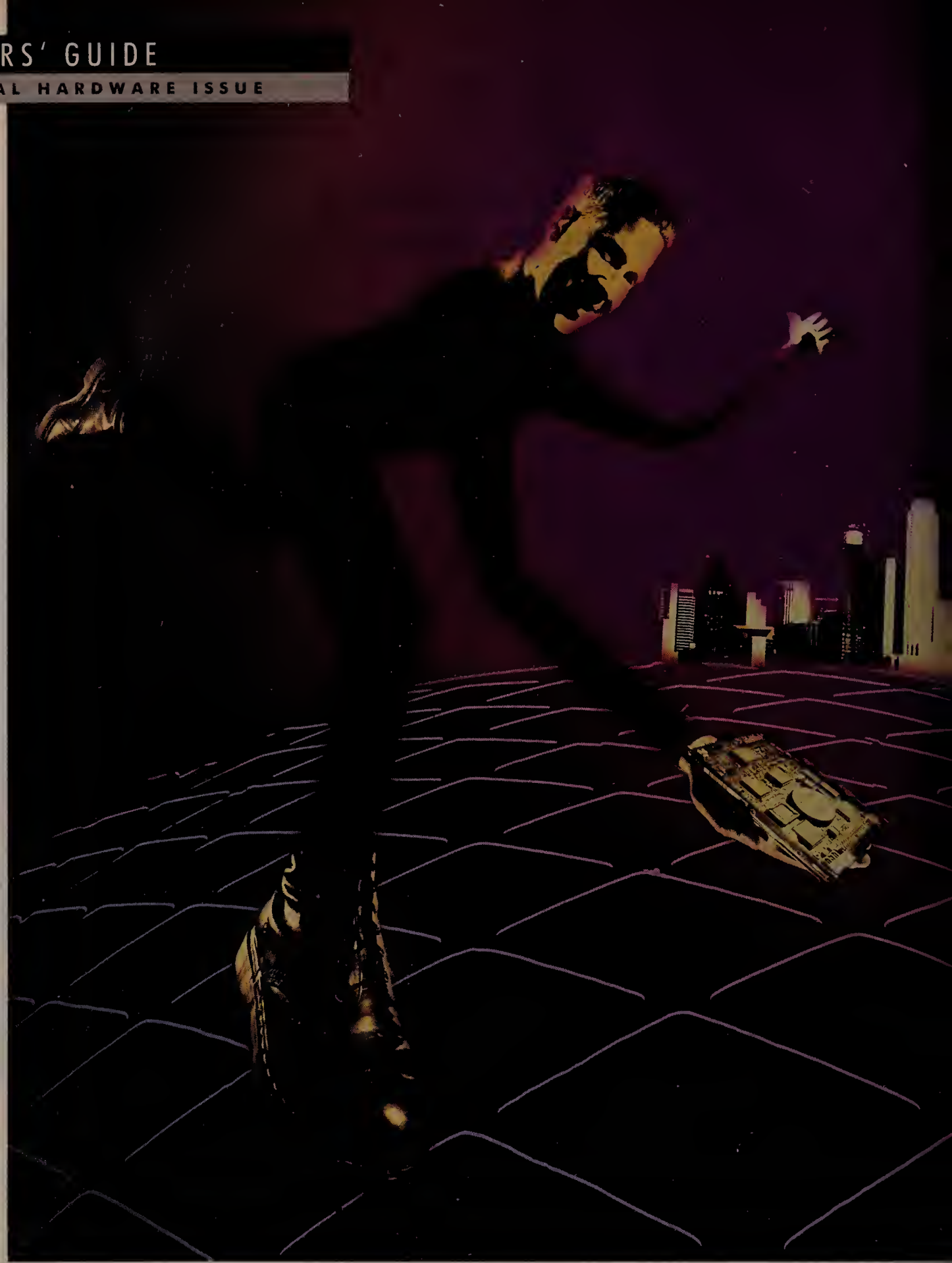
HEWLETT PACKARD

Circle 102 on reader service card



MICHAEL LLEWELLYN

Ever buy the latest *Windows* application only to find you have no place to put it? Face it: That old 40MB drive just can't cut it with today's multimegabyte applications. It's time you looked for a hard disk that can keep up with your needs. If you're like most users and work with a mix of DOS and *Windows 3.0* software, drives in the 100MB-to-125MB range will do nicely. These drives offer plenty of room for applications, even *Windows* disk-gobblers, plus space for massive data bases and worksheets.

Not that these drives are for everyone. Programmers, or desktop publishers with hundreds of font and clip art files, may find even 125MB inadequate.

List prices for these drives range from just under $300 to $1900, or from $2.60 to $15.80 per megabyte. Street prices tend to be much lower, so shop around.

Chances are, however, that you'll need more than just the drive. Drives can't run by themselves, and your cost could go up by as much as $300 if your current controller can't handle your new drive. And if you're not technically inclined, you'll want to pay someone to install your new drive.

A computer and a hard drive can't talk to each other without a device called a controller, which is either attached to your drive or comes on a separate expansion card. If your old

GEORGE CAMPBELL, DAN MILLER, & SUSAN LUSTY

# HARD DISKS

**Running out of breathing space on your hard drive? A 100MB to 120MB drive can fill your storage needs for years to come, even if you use Windows.**

and new drives both use controllers on cards, your old controller *might* work with your new drive, but it's not likely to work well, so you're better off buying your drive and controller together. And if your old controller also handles your floppy drives, keep in mind that your new one must as well.

There are four standard interfaces for hard disks and their controllers, and you need to consider speed, price, and compatibility when choosing the standard that suits you best.

**MFM (modified frequency modulation)** A few drives are still made with this once popular interface, although these drives tend to be slower. MFM controllers come on expansion cards you plug into your bus, and chances are you already have one, although it may not work well with a new 100MB drive.

**IDE (imbedded drive electronics)** Because the IDE standard puts the controller on the drive itself rather than on a separate card, it requires only a simple connector in the computer. PS/2s and many PCs put this connector on the motherboard; it's also available on inexpensive adapter cards. IDE drives normally insist on being the primary drive, making it tricky to set one up to coexist with your older drive. Many IDE drives are relatively inexpensive and therefore a good choice for the budget conscious.

**SCSI (small computer system interface)** A SCSI adapter can control up to seven devices (including CD ROM drives, scanners, and even some printers) each with its own, built-in controller. If you think you may be adding any of these devices,

# ORGANIZING YOUR HARD DISK

*George Campbell and Lincoln Spector*

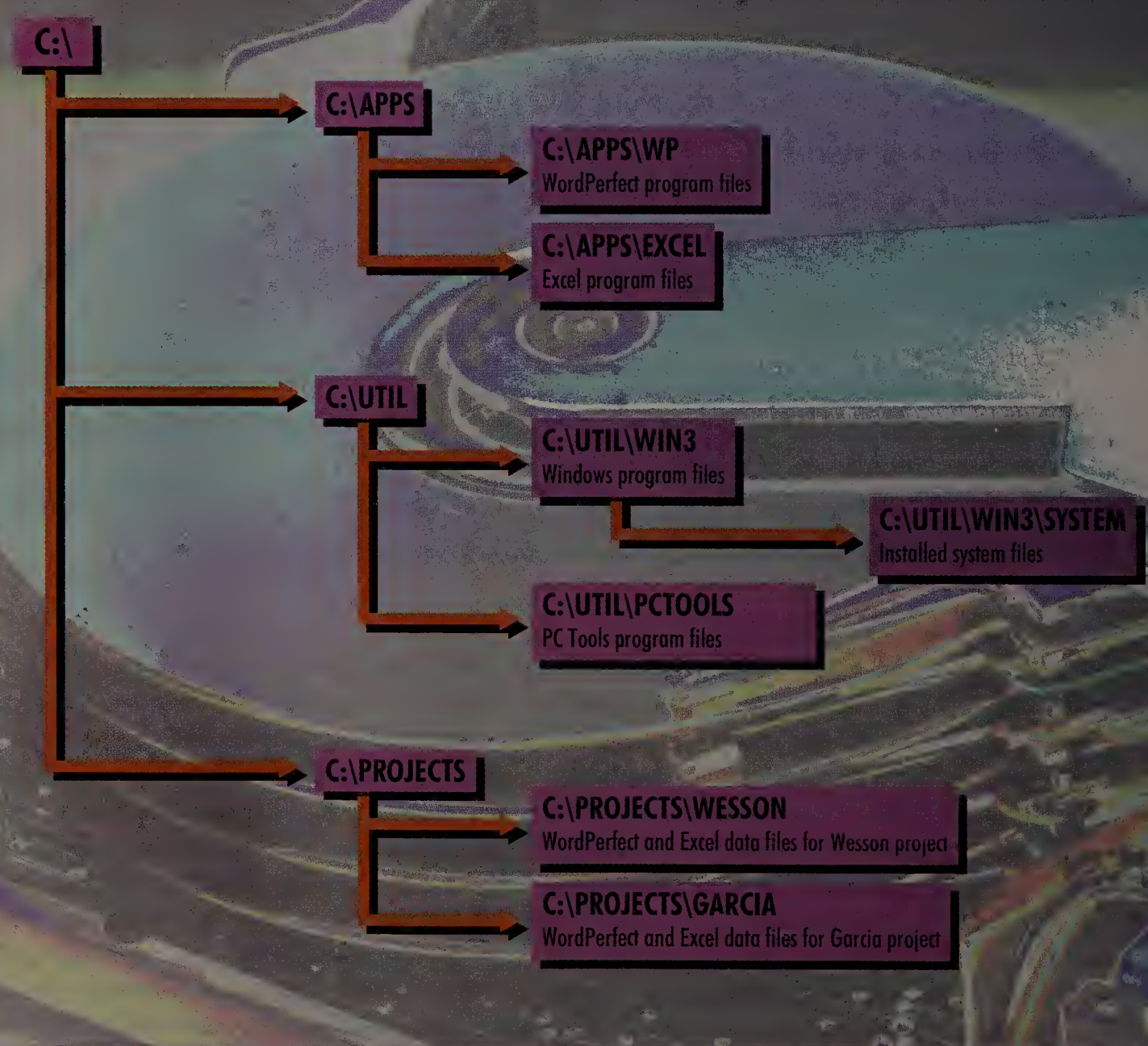
What's the best way to keep a large hard disk organized? Your professional needs, work habits, even your version of DOS affect where you'll want to keep your programs and data.

The first decision you'll have to make—and the hardest to change later—is whether to let DOS see your new drive as several small drives (or *partitions*) or as one large drive (also called a partition). Multiple partitions use the disk more efficiently and make a handy division between types of files. But a single, large partition is less restrictive; a free 20MB in one place is more useful than 9MB here, 8MB there, and 3MB somewhere else. If you're using DOS 2.*x* or 3.*x*, you may not have a choice; the largest partition these versions of DOS support is 32MB.

However many partitions you choose, you must also decide whether to group your data by program or by project.

## ONE PARTITION: DATA AND PROGRAMS SEPARATE

*Setting up your hard disk as one partition—instead of C:, D:, E:, etc.—gives you room to grow in any direction. And organizing your data by project rather than application gives you instant access to related files for linking, archiving, and other cross-application chores.*

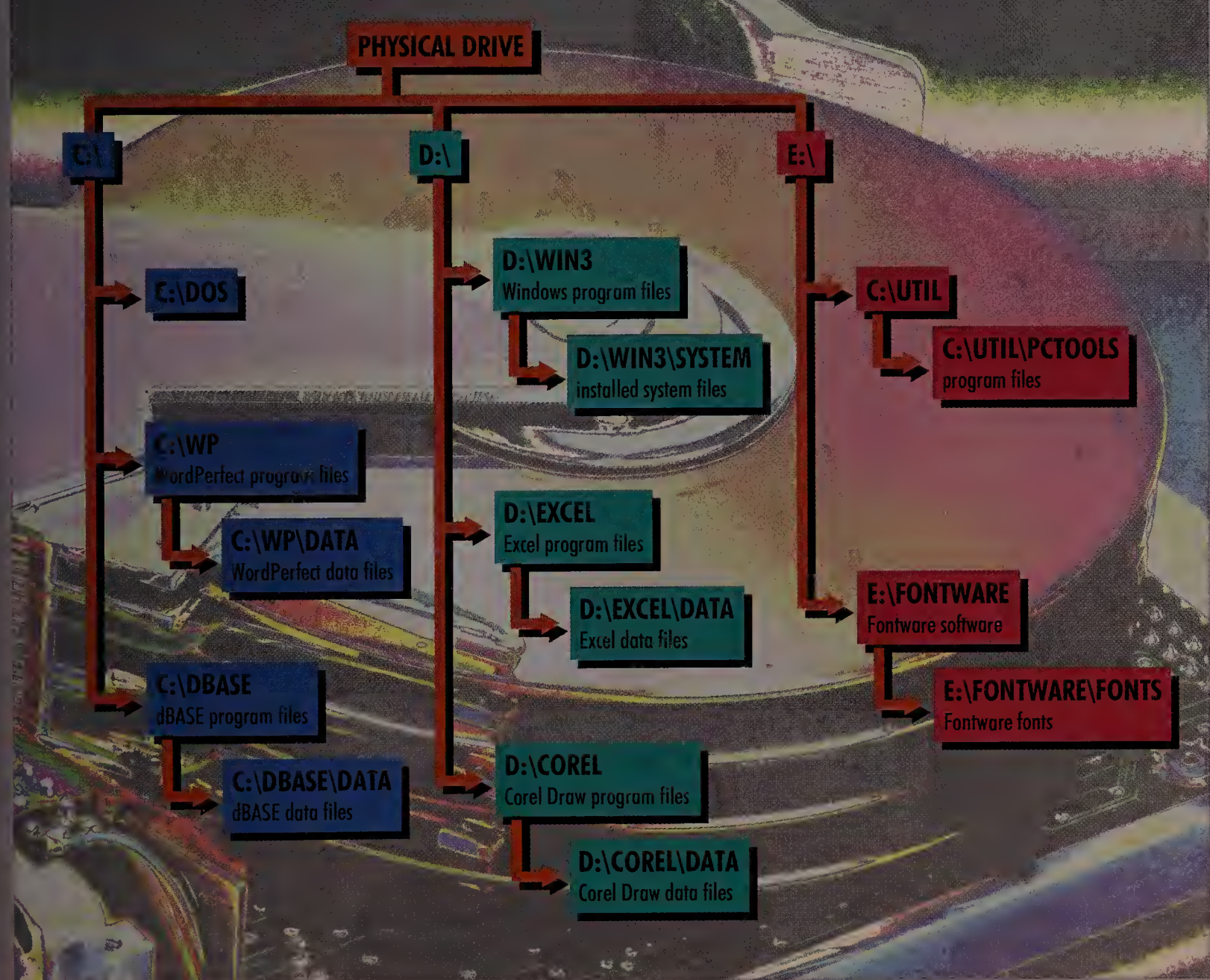


Putting all your 1-2-3 worksheet files in a C:\123\DATA directory lets you reach any WK1 file quickly and easily. But if your projects involve files from various sources, you may prefer to group your data by the jobs you do. For instance, if you keep the Garcia project's worksheets and word processing documents together in the C:\PROJECTS\GARCIA directory (see figure), you'll have an easier time importing a worksheet range into a document.

The accompanying figures show two examples of a well-organized hard drive; there are many others. You could just as easily put all your programs on one partition and all your data on another, use one partition for old data you only occasionally use, or keep your data with your programs on one large partition. If you can easily find the files you need, and the setup accommodates the way you like to work, your hard disk is properly organized.

## SEVERAL PARTITIONS: DATA WITH PROGRAMS

*If you rarely use more than one application to do a job, you may prefer to set up your new hard drive as three or four partitions and keep data in subdirectories. You'll soon learn to associate drive C: with DOS programs, D: with Windows, E: with utilities and fonts, and so on.*



## 100MB TO 125MB HARD DISKS

| Company | Product | Capacity (MB) | List price: Without controller | List price: With AT controller | List price: With Micro Channel controller | Interface[1] | RLL compatible | Size: Width (inches) | Size: Height |
|---|---|---|---|---|---|---|---|---|---|
| CMS ENHANCEMENTS | B120A3-M3540 | 120 | $899 | | | I | Y | 3½ | third |
| | B120A3-N | 120 | $835 | | | I | Y | 3½ | third |
| | B120F2-M5070 | 120 | $1079 | | | M | N | 3½ | third |
| | K100A3-N | 104.9 | $769 | | | I | Y | 3½ | half |
| | K100S3-N | 104.9 | $1051 | | | S | Y | 3½ | half |
| | K120M50Z70-P | 120 | $1199 | | | M,S[3] | N | 3½ | half |
| CONNER PERIPHERALS | Hopi 120MB | 120 | [4] | | | I,S | Y | 3½ | third |
| CORE INT'L | MC120 | 120 | $1150[5] | | | E | N | 3½ | half |
| CUMULUS | 7120A | 124 | $894 | | | I | Y | 3½ | third |
| | CP-30100 | 120 | $916 | | | S | Y | 3½ | third |
| | CP-30104 | 120 | $874 | | | I | Y | 3½ | third |
| | CP-3100 | 104.9 | $836 | | | S | Y | 3½ | half |
| | CP-3104 | 104.9 | $834 | | | I | Y | 3½ | half |
| DISK TECHNOLOGIES (DISCTEC) | RoadRunner XD-120 | 120 | $1900 | | | I,S | Y | 2½ | half |
| FUJITSU AMERICA | M2616 | 105 | $710 | | | M,S | Y | 3½ | half |
| KALOK | KL3100 | 105 | $295 | | | I | Y | 3½ | half |
| MICRONET COMPUTER SYSTEMS | EPS-100-A | 104.9 | $1399 | $1399 | | S | N | 3½ | half |
| MICROSCIENCE INT'L | 7100-20 | 120.4 | $475 | | | I | Y | 3½ | half |
| PACIFIC MAGTRON | MT-4115E/S | 115 | $290 | | | E,S | Y | 5¼ | half |
| PERISOL TECHNOLOGY | LanSafe 110A | 110 | $403 | $419 | | I,S | Y | 3½ | half |
| | LanSafe 110S | 110 | $484 | $591 | $787 | S | Y | 3½ | half |
| | LanSafe 120E | 120 | $619 | $766 | $1096 | E | Y | 3½ | half |
| PROCOM TECHNOLOGY | PIRA120 | 120 | $1095 | | | I | Y | 3½ | half |
| | PMC 120 | 120 | $915 | | | M | N | 3½ | third |
| | PROPAQ 100 | 101 | $675 | | | I | Y | 3½ | half |
| | PROPAQ 120-19 | 124 | $779 | | | I | Y | 3½ | half |
| | S:100/PS3 | 100 | $850 | $1199 | $1199 | S | Y | 3½ | third |
| | S:100/S3TO5 | 100 | $865 | $1214 | $1214 | S | Y | 3½ | third |
| QUANTUM | Hardcard II XL 105 | 105.1 | $869 | $869 | | 9 | Y | 9 | 9 |
| | Impulse DriveKit for Microchannel | 105.1 | $799 | | $999 | S | Y | 3½ | third |
| | ProDrive 120AT/S | 120 | $620 | $620 | | I,S | Y | 3½ | half |
| | ProDrive LPS 105AT/S | 105 | $510 | $510 | | I,S | Y | 3½ | third |
| RODIME SYSTEMS | Cobra 110at | 110 | $839 | $894 | | I | Y | 3½ | half |
| SEAGATE TECHNOLOGY | ST3120 A/N | 107.2 | [4] | | | I,S | Y | 3½ | third |
| | ST1133 N | 113.4 | [4] | | | S | Y | 3½ | half |
| | ST2125 N | 107 | [4] | | | S | N | 5¼ | half |
| | ST4135 R | 115 | [4] | | | M | N | 5¼ | full |
| | ST4144 R | 122.7 | [4] | | | M | N | 5¼ | full |
| STORAGE DIMENSIONS | MacinStor 120i | 120 | $849 | | | S | Y | 3½ | third |
| TEAC AMERICA | SD-3105 | 105 | $395 | | | I,S | Y | 3½ | third |
| TOSHIBA AMERICA INFORMATION SYSTEMS | MK-1034FC | 106 | $590 | $590 | | I | Y | 3½ | third |
| WESTERN DIGITAL | Caviar WDAC2120 | 125 | $470 | | | I | Y | 3½ | third |

[1] E=ESDI, I=IDE, M=MFM, S=SCSI.
[2] Manufacturer estimate.
[3] SCSI controller sold separately.
[4] Company does not sell directly to consumers and has no retail pricing.
[5] Includes Corefast backup software.
[6] For major accounts only.
[7] To or from media/to or from buffer.
[8] Asynchronous/synchronous.
[9] Expansion card drive plugs directly into bus.
[10] SCSI/IDE.

a SCSI drive and adapter card may be your best choice. But there's a catch: Not all SCSI devices work with all SCSI adapters; before you buy a SCSI drive and card, make sure other SCSI devices you own or want will work with it.

**ESDI (enhanced small device interface)** Designed primarily for very large drives, the ESDI standard isn't common in the 100MB range. There are just a few ESDI drives in our chart.

Some drives and controllers use RLL (run-length limited) encoding to reach their 100MB size. This presents no problem as long as *both* the drive and the controller sup-

| Speed | | | Compatibility | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Average access time (ms)[2] | Data transfer rate (MBps) | On-board cache | Optimizing software | Allows low-level formatting | MTBF (hours) | Warranty (years) | Money-back guarantee | Manufacturer-based customer support | Reader service number |
| 19 | 4 | N | Y | N | 40,000 | 1 | N | Y | 682 |
| 19 | 4 | N | Y | N | 100,000 | 1 | N | Y | 682 |
| 19 | 4 | Y | Y | Y | 45,000 | 1 | N | Y | 682 |
| 25 | 4.75 | N | Y | N | 100,000 | 1 | N | Y | 682 |
| 25 | 2.5 | N | Y | Y | 100,000 | 1 | N | Y | 682 |
| 23 | 1.25 | N | Y | Y | 45,000 | 1 | N | Y | 682 |
| 19 | 1.5 | Y | N | Y | 150,000 | 1 | N | N | 683 |
| 23 | 1 | N | Y | Y | 45,000 | 1 | Y | Y[6] | 684 |
| 15 | 1.5/6[7] | N | Y | N | 150,000 | 1 | Y | Y | 685 |
| 19 | 1.5/4[7] | N | Y | N | 40,000 | 1 | Y | Y | 685 |
| 19 | 1.5/4[7] | N | Y | N | 40,000 | 1 | Y | Y | 685 |
| 25 | 1.25/1.66[7] | N | Y | N | 50,000 | 1 | Y | Y | 685 |
| 25 | 1.25/4.75[7] | Y | Y | N | 50,000 | 1 | Y | Y | 685 |
| 19 | 1.25 | Y | Y | N | 100,000 | 1 | Y | Y | 686 |
| 26 | 1.5/2.5[8] | Y | N | Y | 50,000 | 1 | N | Y | 687 |
| 19 | 1.25 | Y | Y | N | 100,000 | 1 | N | Y | 688 |
| 25 | 3.75 | Y | Y | Y | 28,000 | 1 | Y | Y | 689 |
| 18 | 1.25 | Y | N | N | 60,000 | 1 | N | Y | 690 |
| 16 | 1.25 | N | N | Y | 100,000 | 2 | Y | Y | 691 |
| 18 | 1.25 | Y | Y | N | 100,000 | 1 | Y | Y | 692 |
| 18 | 1.25 | Y | Y | Y | 100,000 | 1 | Y | Y | 692 |
| 18 | 1.25 | Y | Y | Y | 100,000 | 1 | Y | Y | 692 |
| 19 | 1.25 | Y | Y | N | 150,000 | 1 | N | Y | 693 |
| 19 | 1.5 | Y | Y | Y | 20,000 | 1 | N | Y | 693 |
| 25 | 1.25 | Y | Y | N | 100,000 | 1 | N | Y | 693 |
| 19 | 1.5 | Y | Y | N | 150,000 | 1 | N | Y | 693 |
| 18 | 1.25 | Y | Y | Y | 70,000 | 1 | N | Y | 693 |
| 18 | 1.25 | Y | Y | Y | 70,000 | 1 | N | Y | 693 |
| 9 | 1.4 | Y | Y | N | 60,000 | 2 | N | Y | 694 |
| 9 | .75/1.5[8] | Y | Y | N | 60,000 | 2 | N | Y | 694 |
| 15 | 4 | Y | Y | N | 50,000 | 2 | N | Y | 694 |
| 17 | 2/4[10] | Y | N | N | 60,000 | 2 | N | Y | 694 |
| 20 | 0.75 | Y | Y | N | 40,000 | 2 | N | Y | 695 |
| 16 | 1.5 | Y | Y | Y | 150,000 | 1 | N | Y | 696 |
| 15 | 1.25 | Y | Y | Y | 150,000 | 1 | N | Y | 696 |
| 18 | 1.1 | N | Y | Y | 100,000 | 1 | N | Y | 696 |
| 28 | 0.9 | N | Y | Y | 40,000 | 1 | N | Y | 696 |
| 28 | 0.9 | N | Y | Y | 40,000 | 1 | N | Y | 696 |
| 15 | 1.5 | Y | Y | Y | 150,000 | 2 | N | Y | 697 |
| 19 | 2/4[10] | N | N | Y | 30,000 | 1 | N | N | 698 |
| 16 | 1.6 | Y | Y | N | 40,000 | 1 | N | Y | 699 |
| 15 | 1.9 | Y | Y | N | 100,000 | 2 | N | N | 700 |

**For more information about all products in this table, circle reader service no. 905.**

port RLL. If you use an RLL drive with a non-RLL controller, you'll get much less storage space than you paid for; if you use an RLL controller with a non-RLL drive, you'll endanger your data. If you're buying a drive and controller separately (this is not possible with IDE or SCSI drives), make sure you know the RLL status of each.

Another compatibility problem: The BIOS in many older systems will not support your drive of choice. Before buying, check your BIOS version (if you don't see it listed when you boot up, utilities like *PC Tools Deluxe* can display it), and ask the vendor about compatibility. You may need a new BIOS chip or a special software driver, either of which your dealer can supply.

## FINDING A PERFECT FIT

Drives and drive bays (the compartments in computers that drives go into) are usually 3½ or 5¼ inches wide and either full-, half-, or third-height. A smaller drive will fit in a larger bay with the help of an inexpensive bracket. But trying to stuff a larger drive into a smaller bay is like writing a love story into the plot of *Moby Dick*—it just won't fit.

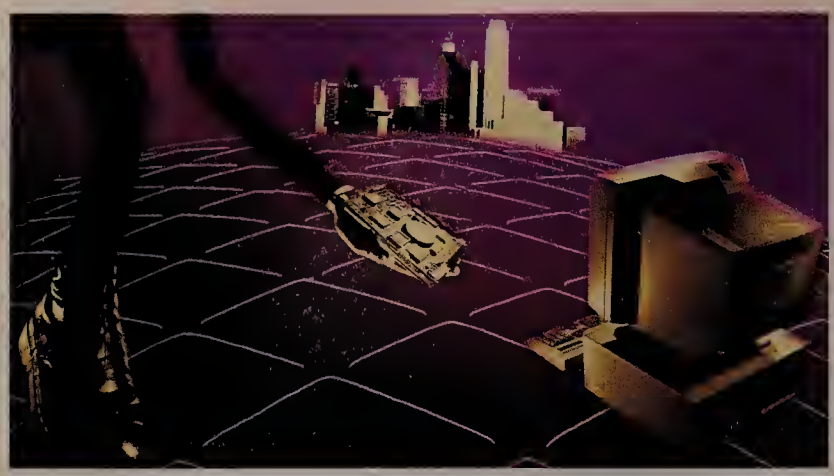
Unfortunately, some computers have unusual bays that don't easily accept conventional drives. The differences generally aren't major, just an unorthodox mounting bracket or the like, and you should be able to buy an adapter to remedy the problem. But check with your system dealer to find out if your computer has any such restrictions.

You could avoid the whole drive bay issue by buying a drive mounted on an expansion card, such as the Quantum Hardcard. These drives tend to be expensive, and they'll rob you of an expansion slot. But since they slide directly into your expansion bus, they're easy to install.

## THE GREAT DATA RACE

It doesn't matter how fast your processor is—if you have a slow hard disk, you have a slow computer. A new 100MB drive is almost certain to be faster than an old 40MB disk, but you'll still want the fastest you can afford.

The two most common measures of a hard drive's speed are its *average access*



*time*—the average time the drive head takes to reach and read a random spot on the disk—and its *data transfer rate*—a measure of how fast data moves from the drive to your PC's memory. Look for a low access time and a high transfer rate, although you'll need a computer with an EISA or Micro Channel bus to take advantage of a transfer rate of more than 1.2MB per second.

A controller with an *on-board cache* can increase your drive's effective speed. A cache is a chunk of RAM that sits between your drive and your computer; by keeping commonly used data where it can be grabbed quickly, a cache reduces the amount of time your computer spends accessing your hard disk.

## SOFTWARE COMPATIBILITY

While virtually any drive should work with your applications, not every drive may be compatible with your favorite disk-maintenance utility.

A few drives choke on the disk optimizers that come with *PC Tools Deluxe, Norton Utilities,* and other utility packages. As you delete and create files, your drive's data becomes fragmented, scattered like startled sheep. The result is wear and tear on the drive's read/write arm and a slower hard disk, and if you can't use an optimizer to herd the files back together, you'll miss one of the greatest benefits of most hard disk utility packages.

Less important is a drive's ability to accept *low-level formatting.* Programs such as *SpinRite* can reduce drive failures and general wear by redoing the low-level format that all hard drives require. Some preformatted drives can't accept, and generally don't need, such reformatting. All these drives can accept the normal, high-level format of DOS's FORMAT command.

## RELIABILITY

A drive's *MTBF (mean time between failures)* is the number of hours it's likely to run before it dies. This number represents manufacturers' calculations and should be taken with several grains of salt. After all, some manufacturers claim 100,000 hours—over 11 years—of continuous operation, and you can be sure they didn't test the drive for anything near that long.

All these drives offer a warranty of at least a year, which should be adequate. A money-back guarantee, however, is a real plus should a drive be DOA or incompatible with your system.

If you lack confidence in your local dealer, buy a drive with manufacturer-based customer support. If your dealer proves incompetent or goes bankrupt, you'll still have someone to call when problems arise.

When your hard drive feels as if it's shrunk over the years, try something more roomy. Both you and your data will be a lot more comfortable. ●

*George Campbell is a contributing editor, Dan Miller the Fluegelman Intern, and Susan Lusty and Lincoln Spector assistant editors for* PC World.

## WHERE TO BUY

**CMS Enhancements, Inc.**
2722 Michelson Dr.
Irvine, CA 92715
714/222-6000,
714/549-4004 (fax)

**Conner Peripherals, Inc.**
3081 Zanker Rd.
San Jose, CA 95134
408/456-4500,
408/456-4501 (fax)

**Core Int'l, Inc.**
7171 N. Federal Hwy.
Boca Raton, FL 33487
407/997-6055,
407/997-6009 (fax)

**Cumulus Corp.**
23500 Mercantile Rd.
Cleveland, OH 44122
216/464-2211,
216/464-2483 (fax)

**Disk Technologies (Disctec) Corp.**
904 Railroad Ave.
Winter Park, FL 32789
800/553-0337,
407/628-4404 (fax)

**Fujitsu America, Inc.**
3055 Orchard Dr.
San Jose, CA
95134-2022
800/626-4686

**Kalok Corp.**
1289 Anvilwood Ave.
Sunnyvale, CA 94089
408/747-1315,
408/747-1319 (fax)

**Micronet Computer Systems, Inc.**
6970 Aragon Cir.,
Bldg. 3
Buena Park, CA
90620
800/468-6273,
714/739-2244,
714/739-4220 (fax)

**Microscience Int'l Corp.**
90 Headquarters Dr.
San Jose, CA 95134
408/433-9898,
408/954-0988 (fax)

**Pacific MagTron, Inc.**
568 Weddell Dr. #8
Sunnyvale, CA 94089
800/828-2822,
408/744-0178 (fax)

**Perisol Technology Corp.**
3350 Scott Blvd.
#1201
Santa Clara, CA
95054
800/447-8226,
408/988-4431 (fax)

**Procom Technology, Inc.**
200 McCormick Ave.
Costa Mesa, CA
92626
800/800-8600,
714/549-0527 (fax)

**Quantum Corp.**
500 McCarthy Blvd.
Milpitas, CA 95035
408/894-4000,
408/894-3218 (fax)

**Rodime Systems, Inc.**
7700 W. Camino Real
Boca Raton, FL 33433
800/227-4144,
407/391-9950 (fax)

**Seagate Technology, Inc.**
920 Disc Dr.
Scotts Valley, CA
95066-4544
800/468-3472,
408/438-7852 (fax)

**Storage Dimensions**
1656 McCarthy Blvd.
Milpitas, CA 95035
408/954-0710,
408/944-1200 (fax)

**TEAC America Inc.**
7733 Telegraph Rd.
Montebello, CA
90640
213/726-0303,
213/727-7652 (fax)

**Toshiba America Information Systems, Inc.**
9740 Irvine Blvd.
Irvine, CA 92718
714/583-3000,
714/583-3133 (fax)

**Western Digital Corp.**
8105 Irvine Center Dr.
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714/932-4900,
714/932-6498 (fax)

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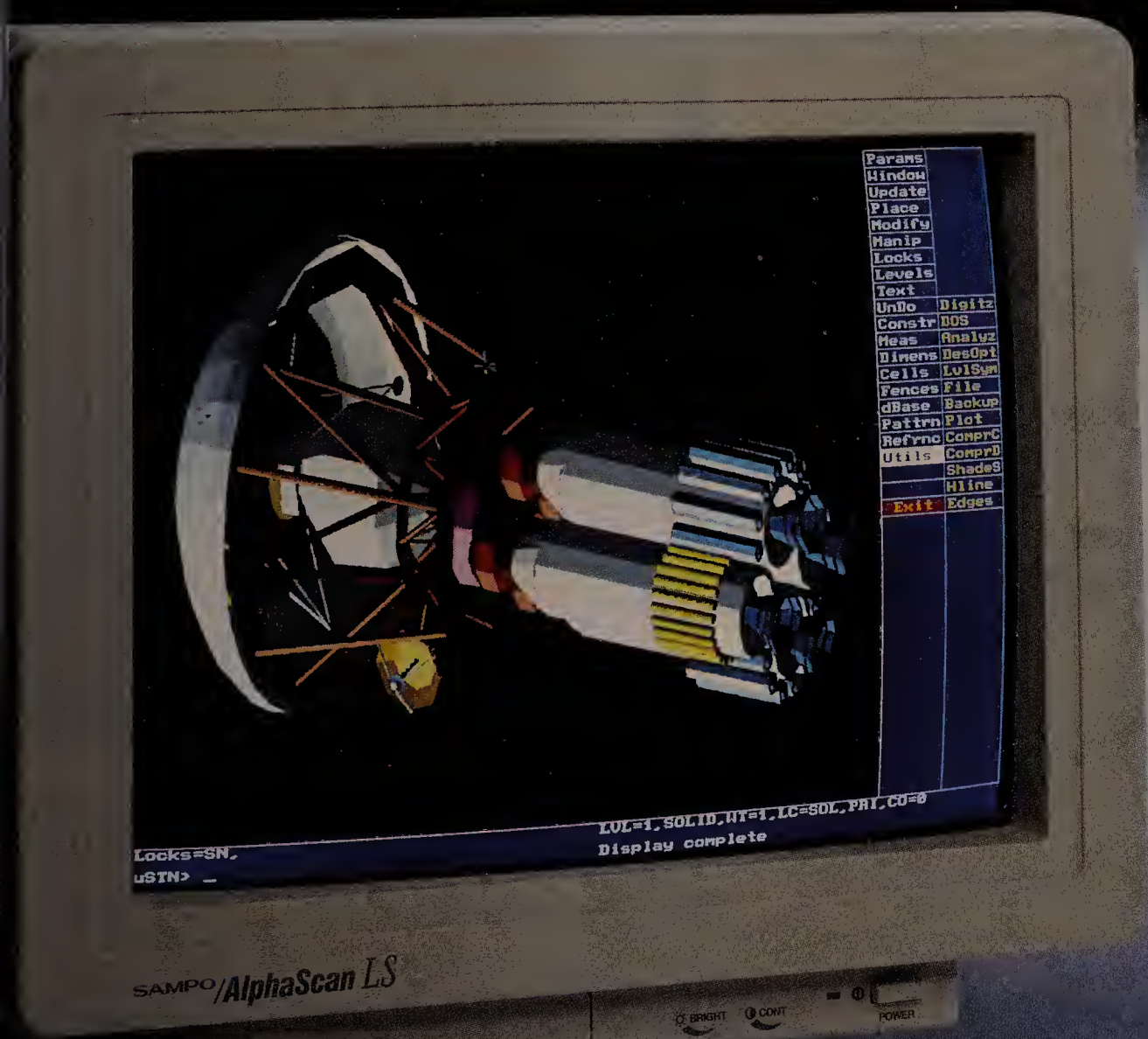


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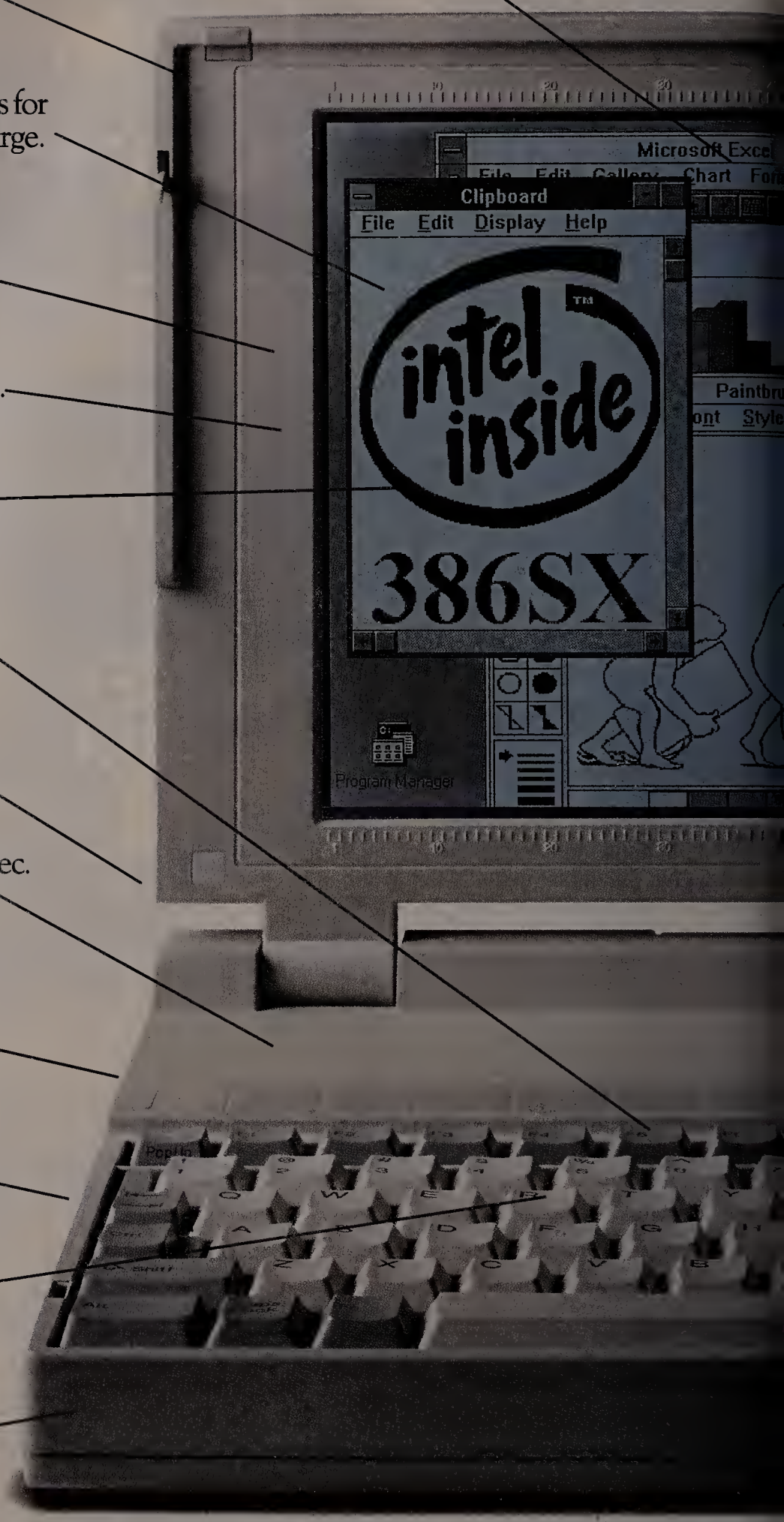


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# HIGH SPEED MODEMS

## Supersonic V.32 modems with data compression can save precious time and shrink those annoying on-line and long-distance charges.

Are file uploads and downloads sending your long-distance bills through the roof? Do you grow frustrated waiting for the screen to refresh when you call in to your office PC with a remote communications package? Are you accumulating steep data base service charges? With the spread of *Windows* and other graphical applications, program and data files keep getting larger. Small wonder your 2400-baud modem seems to be slowing to a crawl.

It's probably time to consider buying a *high-speed modem*—a device that lets your computer exchange data over telephone lines at lightning speed. Now that prices are dropping and standards are firming up, a faster high-speed modem can pay off in lower on-line costs, cheaper phone bills, and increased productivity.

Not long ago every vendor's high-speed modems spoke a different language, so you needed the same brand on both ends in order to communicate faster than 2400 baud. But all that has changed; now almost all high-speed modem vendors are producing their units with V.32/V.32bis for the modulation standard and V.42/V.42bis as the error correction/data compression standard. A full explanation of these standards follows, but the bottom line is that modems manufactured with these protocols should give you extremely fast throughput of between 9600 and 38,000 baud.

The term *baud* relates to the speed at which the modem modulates signals. However, when calculating the overall PC-to-PC throughput of data, including the effect of data compression and error correction, it's more meaningful to use the bits per second (bps) measurements.

This buyers' guide lists 103 V.32/V.32bis modems that run V.42/V.42bis. To focus the guide, we've cut out rack-mounted models and those requiring the special leased-line

BRETT GLASS

STEVEN BARATZ

connections commonly used in mainframe environments.

We've also omitted modems that have a list price higher than $1400. It wasn't long ago that very few high-speed modems would have passed this price test, but with V.32 modems now selling for as little as $399, it's easy to recommend them to just about anyone. If you're on a tight budget, however, or if you're browsing through text on line rather than exchanging files, a $100-to-$300 2400-baud modem will do just as well for you. (See "Buyers' Guide: 2400-Baud Modems" in our September 1991 issue).

For many applications, we clearly recommend high-speed modems. If you frequently perform PC-to-PC or PC-to-mainframe file transfers (especially long distance), you should go high. If you download files from an on-line service that charges by the minute, go high. If you're using a remote package to run applications from afar, go high (especially if you're remotely running *Windows*). And if you're setting up a modem for your network or bridging two LANs via modem, get the fastest modem you can buy.

The key buying issue with high-speed modems is protocol support. Protocols are the common procedures by which modems operate, and modems differ in the types of protocols they support. Comprehensive support will let you link with the most modems at the fastest possible speeds. Unfortunately, the names of the modem standards devised by the Consultative Committee for International Telephony and Telegraphy (CCITT) seem almost intentionally designed to baffle users. You might think, for example, that a V.42bis modem is necessarily faster than a V.32bis modem. It isn't. A 2400-baud non-V.32 modem running V.42bis is slower than a 9600-baud V.32 modem that lacks V.42bis.

Confused? Then let's start over. All the modems in this guide can use several different *modulation schemes*—the standards that describe the sounds the modems make when

## HIGH-SPEED MODEMS

| Manufacturer | Product | Price | Warranty (years) | Interface | V.32 | V.32bis | Other protocols | Fax | Power switch | Volume control switch | Callback security |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ADVANCED MICROCOMPUTER SYSTEMS | Xpress 96 | $499 | 5 | external | Y | Y | none | Y | N | Y | Y |
| | Xpress 96MC | $450 | 5 | MC | Y | Y | none | Y | N | Y | Y |
| | Xpress 96PC | $425 | 5 | ISA | Y | Y | none | Y | N | Y | Y |
| AT&T PARADYNE | Comsphere 3820 | $1395 | 2 | external | Y | Y | none | N | Y | N | Y |
| ATI TECHNOLOGIES | 9600 etc/e | $499 | 2 | external | Y | N | none | N | Y | Y | N |
| BEST DATA PRODUCTS | Smart One 9642X | $599 | 2 | external | Y | N | none | N | Y | N | N |
| CARDINAL TECHNOLOGIES | 9600V.42 | $699 | 1 | external | Y | N | none | N | Y | N | N |
| CMS ENHANCEMENTS | CMS Calling Card X9600BX | $779 | 2 | external | Y | N | none | N | Y | Y | Y |
| COMPUCOM | SpeedModem Star (external) | $539 | 5 | external | Y | Y | C | [1] | N | Y | N |
| | SpeedModem Star (internal) | $499 | 5 | ISA | Y | Y | C | [1] | N | Y | N |
| | SpeedModem Storm (external) | $339 | 5 | external | Y | N | C | [1] | Y | Y | N |
| | SpeedModem Storm (internal) | $299 | 5 | ISA | Y | N | C | [1] | N | Y | N |
| COMPUTER PERIPHERALS | ViVa 9632e | $699 | 5 | external | Y | Y | none | N | Y | N | N |
| | ViVa 9642e | $649 | 5 | external | Y | N | none | N | Y | N | N |
| CXR/ANDERSON JACOBSON | 9632-MM2 | $1275 | 1 | external | Y | Y | none | N | Y | N | Y |
| DATATREK | DataTrek V.32 Modem | $795 | 2 | external | Y | N | none | N | Y | Y | Y |
| DIGICOM SYSTEMS | 9624 LE | $795 | 2 | external | Y | N | none | N | Y | Y | Y |
| | 9624 LE+ | $895 | 2 | external | Y | Y | none | Y | Y | Y | Y |
| | 9624 PC | $765 | 2 | ISA | Y | N | none | N | N | Y | Y |
| | 9624 PC+ | $865 | 2 | ISA | Y | Y | none | Y | N | Y | Y |
| DOWTY COMMUNICATIONS | DCM 4232 | $1095 | 1 | external | Y | N | none | N | N | N | N |
| E-TECH RESEARCH | Bullet Modem E9696M | $795 | 2 | external | Y | N | none | N | Y | N | Y |
| | Bullet Modem PC9696M | $745 | 2 | ISA | Y | N | none | N | N | N | N |
| EVEREX SYSTEMS | Evercom 96+ | $649 | 2 | ISA | Y | N | none | N | N | N | N |
| | Evercom 96E+ | $699 | 2 | external | Y | N | none | N | Y | N | N |
| FASTCOMM COMMUNICATIONS | FDX 9696 | $999 | 2 | external | Y | [1] | none | N | Y | Y | N |
| | FDX 9696B | $999 | 2 | ISA | Y | [1] | none | N | N | N | N |
| | FDX 9696S | $1199 | 2 | external | Y | [1] | none | N | Y | Y | N |
| FORVAL AMERICA | IM 9600 | $775 | 5 | ISA | Y | N | none | N | N | N | Y |
| | IM 14400 | $1045 | 5 | ISA | Y | Y | none | N | N | N | N |
| | SA 9600 | $795 | 5 | external | Y | N | none | N | N | N | Y |
| | SA 14400 | $1245 | 5 | external | Y | Y | none | N | N | N | N |
| GALAXY NETWORKS | UFO 9600 | $999 | 2 | external | Y | N | none | N | Y | Y | N |
| | UFO V.32bis 1440 | $1099 | 2 | external | Y | Y | none | N | Y | Y | N |
| GANDALF SYSTEMS | Access Series 3242bis | $1095 | 1 | external | Y | N | none | N | N | N | Y |
| GENERAL DATACOMM | DataComm 596 | $1150 | 1 | external | Y | N | none | N | N | N | N |
| | DeskTop 596 | $995 | 1 | external | Y | N | none | N | Y | Y | N |
| GVC TECHNOLOGIES | SM-96 | $599 | 5 | external | Y | N | none | N | N | N | Y |
| | SM-96+ | $699 | 5 | external | Y | Y | none | N | N | N | Y |
| | SM-96H | $559 | 5 | ISA | Y | N | none | N | N | Y | Y |
| HAYES MICROCOMPUTER PRODUCTS | Optima 96 | $450[2] | 2 | external | N | N | none | N | Y | N | N |
| | Ultra 96 | $999 | 2 | external | Y | N | E | N | Y | N | N |
| | Ultra 144 | $1199 | 2 | external | Y | Y | E | N | Y | N | N |
| INTEL | Intel 9600EX Modem | $799 | 5 | external | Y | N | none | N | Y | Y | N |
| MAYA COMPUTER | Maya Modem 9600 | $525 | 1 | external | Y | N | none | N | Y | N | Y |

[1] Extra-cost option.
[2] Estimated price. Hayes offers no official list price on the Optima 96.

C = CSP 9600.
E = Express 9600.

**For more information about all products in this table, circle reader service no. 903.**

| Bundled software | Reader service number |
|---|---|
| Bitcom, Bitfax | 624 |
| Bitcom, Bitfax | 624 |
| Bitcom, Bitfax | 624 |
| none | 625 |
| none | 626 |
| Bitcom | 627 |
| none | 628 |
| none | 629 |
| with fax option: MTEZ Express fax | 630 |
| with fax option: MTEZ Express fax | 630 |
| with fax option: MTEZ Express fax | 630 |
| with fax option: MTEZ Express fax | 630 |
| QuickLink II | 631 |
| QuickLink II | 631 |
| none | 632 |
| none | 633 |
| none | 634 |
| Flashfax | 634 |
| none | 634 |
| Flashfax | 634 |
| none | 635 |
| none | 636 |
| none | 636 |
| Procomm | 637 |
| Procomm | 637 |
| none | 638 |
| none | 638 |
| none | 638 |
| none | 639 |
| Communications by Crosstalk | 639 |
| none | 639 |
| Communications by Crosstalk | 639 |
| Telix | 640 |
| Telix | 640 |
| none | 641 |
| none | 642 |
| none | 642 |
| none | 643 |
| none | 643 |
| Communications by Crosstalk | 643 |
| Smartcom EZ | 644 |
| none | 644 |
| none | 644 |
| Communications by Crosstalk | 645 |
| White Knight | 646 |

(continues on page 240)

they communicate with one another. Because the modems we have listed here all support the Bell 103J modulation scheme, they are able to communicate with 300-baud modems. Support for Bell 201A and V.22bis lets them talk with 1200-baud and 2400-baud modems, respectively. V.32 governs communications at 9600 baud, and V.32bis starts off at 14,400 baud.

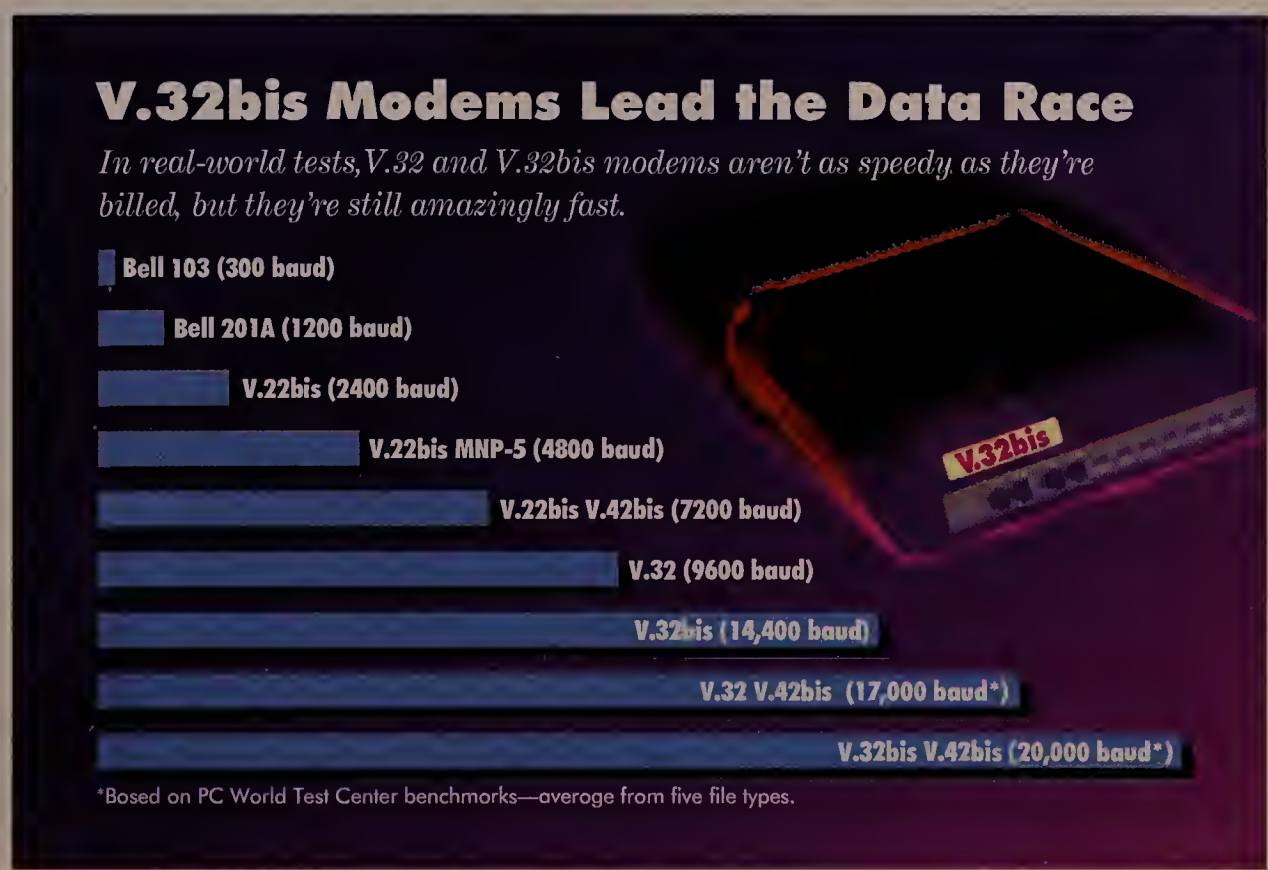
The second group of standards governs *error correction,* which ensures that data gets through intact, and *data compression,* which condenses information into fewer bits so more information can move more quickly. Most modems use Microcom's MNP 4 error correction and MNP 5 data compression standards, which together typically double throughput. Recently, many modems (including 2400-baud models) have added the CCITT's V.42 error correction standard and V.42bis data compression protocol, which together more than triple throughput.

The good news is that every modem in this table offers V.42bis, V.42, MNP 4, and MNP 5 error correction and data compression, so you're compatible with just about everybody. When you add V.42bis data compression to V.32 or V.32bis modulation, you get an optimal throughput of about 30,000 (V.32) and 38,400 (V.32bis) bps from modem to modem. Due to all the stops and starts of modem communications and the bottleneck of the serial link between the modems and the connected PCs, the actual disk-to-disk throughput over a typical phone line is much slower. In *PC World* Test Center benchmarks of several popular V.32 and V.32bis modems, V.32 modems averaged 17,000 bps, and V.32bis modems clocked in at about 20,000 bps.

The actual throughput depends on the file type. When transferring the fastest file types, it matters little whether you have V.32 or V.32bis—data base files transferred at about 24,000 bps, and TIFF graphics traveled about 23,000 bps on both V.32 and V.32bis models. On the other hand, if you send a lot of text or program files, V.32bis modems can really pay off: With text they averaged 22,000 bps compared to 16,000 bps for V.32 models, and binary files were timed at about 18,000 bps for V.32bis and only 13,000 bps for V.32.

If you plan to use your modem to download ZIPped data and program files, the performance boost is less dramatic. Because the ZIP software compression conflicts with the hardware-based V.42bis compression, real-world throughput is *slower* than the raw speeds of the modems; 8000 bps for the 9600-baud V.32 modems and just over 10,000 bps for V.32bis models. The moral: Turn off your V.42bis compression when you're downloading ZIPped files. (See the figure.)

Some modems also support one or more proprietary protocols, which will permit you to communicate at top speed with older non-V.32 high-speed modems. For example, the U.S. Robotics Courier HST Dual Standard supports HST (High-Speed Technology) so it can talk at 9600 bps to the many BBS systems that use HST-only Couriers. The Telebit T2500 supports PEP (Packet Ensemble Protocol) so it can chat with the many Telebit units that are popular in



## HIGH-SPEED MODEMS

| Manufacturer | Product | Price | Warranty (years) | Interface | V.32 | V.32bis | Other protocols | Fax | Power switch | Volume control switch | Callback security |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MICROCOM | QX/4232bis | $999 | 1 | external | Y | Y | M | N | N | Y | N |
| | QX/4232hs | $899 | 1 | external | Y | N | M | N | N | Y | N |
| MICROGATE | GV32 | $599 | 1 | external | Y | N | none | N | Y | N | N |
| | MV32 | $999 | 1 | ISA, MC | Y | N | none | N | N | N | N |
| MICRO INTEGRATED COMMUNICATIONS (MICC) | 9600/PC | $695 | 2 | ISA | Y | N | none | N | N | N | Y |
| | 9600/SA | $795 | 2 | external | Y | N | none | N | Y | N | Y |
| | 9610/SA | $995 | 2 | external | Y | N | none | N | Y | N | Y |
| | 9620/SA | $1195 | 2 | external | Y | N | none | N | Y | N | Y |
| | 14410/SA | $1195 | 2 | external | Y | Y | none | N | Y | N | Y |
| MOTOROLA CODEX | 3260/61 Data Modem | $1195 | 2 | external | Y | Y | none | N | Y | N | Y |
| MULTI-TECH SYSTEMS | MultiModemV32B | $1099 | 2 | external | Y | Y | none | N | Y | Y | Y |
| | MultiModemV32BL | $1199 | 2 | external | Y | Y | none | N | Y | Y | Y |
| NEC AMERICA | N9635E | $1199 | 1 | external | Y | N | none | N | Y | Y | Y |
| OCTOCOM SYSTEMS | OSI 8196 | $1195 | 1 | external | Y | Y | none | N | Y | N | Y |
| PENRIL DATACOMM NETWORKS | Alliance V.32 | $1045 | 1 | external | Y | N | none | N | N | N | Y |
| | Alliance V.32/14.4 | $1395 | 1 | external | Y | Y | none | N | N | N | Y |
| | Alliance V.32M | $1145 | 1 | external | Y | N | none | N | N | N | Y |
| PRACTICAL PERIPHERALS | PM9600 Half-Card | $599 | 5 | ISA | Y | N | none | N | N | N | N |
| | PM9600SA V.32/V.42bis | $699 | 5 | external | Y | N | none | N | Y | N | N |
| PROMETHEUS PRODUCTS | ProModem 9600 EC | $795 | 2 | external | Y | N | none | N | Y | N | Y |
| | ProModem 9600 Plus | $895 | 2 | external | Y | N | none | Y | Y | N | Y |
| | ProModem Ultima | $995 | 2 | external | Y | Y | none | Y | Y | N | Y |
| RACAL-DATACOM | RMD 3222 | $1295 | 1 | external | Y | Y | none | N | [1] | Y | Y |
| | RMD 3232 | $795 | 1 | ISA | Y | N | none | N | N | Y | N |
| | RMD 3296 | $1095 | 1 | external | Y | N | none | N | N | N | Y |
| STAR LOGIC | DM-9600V+ | $395 | 1 | external | Y | N | none | N | Y | N | N |
| SUPRA | SupraFaxModem V.32 | $399 | 5 | external | Y | Y | none | Y | Y | N | N |
| | SupraFaxModem V.32bis | $469 | 5 | external | N | N | none | Y | Y | N | N |
| SWAN TECHNOLOGIES | 9600 bps External | $449 | 2 | external | Y | N | none | N | Y | N | N |
| TELCOR SYSTEMS | T/Card V.32 | $699 | 3 | ISA | Y | N | none | N | N | N | Y |
| | T/Card V.32bis | $899 | 3 | ISA | Y | Y | none | N | N | N | Y |
| TELEBIT | QBlazer | $745 | 2 | external | N | N | none | N | Y | N | N |
| | T1600 | $795 | 2 | external | Y | N | none | N | Y | N | Y |
| | T2500 | $1345 | 2 | external | Y | N | P | N | Y | N | Y |
| | T3000 | $1095 | 2 | external | Y | N | none | N | Y | Y | Y |
| TELEGLOBE | DA 3214 | $1295 | 1 | external | Y | Y | none | N | Y | Y | Y |
| TELENETICS | TC9642 | $695 | 5 | external | Y | Y | none | N | Y | N | N |
| UDS MOTOROLA | FasTalk Fax32 | $995 | 1 | external | Y | N | none | Y | Y | Y | N |
| | FasTalk V.32/42b Data Modem | $795 | 1 | external | Y | N | none | N | Y | Y | N |
| | V3227 Data Modem | $950 | 1 | external | Y | N | none | N | Y | Y | N |
| | V.3229 Data Modem | $1145 | 1 | external | Y | Y | none | N | Y | Y | N |
| U.S. ROBOTICS | Courier HST Dual Standard | $1295 | 2 | external | Y | Y | H | N | Y | Y | Y |
| | Courier HST Dual Standard (internal) | $1249 | 2 | ISA | Y | Y | H | N | N | N | Y |
| | Courier V.32bis | $995 | 2 | external | Y | Y | none | N | Y | Y | Y |
| | Courier V.32bis (internal) | $949 | 2 | ISA | Y | Y | none | N | N | N | Y |

[1] Extra-cost option.
P = PEP.

H = HST.
M = MNP 10.

**For more information about all products in this table, circle reader service no. 903.**

| Bundled software | Reader service number |
|---|---|
| Carbon Copy Plus 6.0 | 648 |
| Carbon Copy Plus 6.0 | 648 |
| none | 649 |
| SDLC Dialer | 649 |
| none | 647 |
| none | 647 |
| none | 647 |
| none | 647 |
| none | 647 |
| none | 650 |
| none | 651 |
| none | 651 |
| none | 652 |
| none | 653 |
| none | 654 |
| none | 654 |
| none | 654 |
| QuickLink II, CompuServe | 655 |
| CompuServe | 655 |
| Communications by Crosstalk | 656 |
| Communications by Crosstalk, fax | 656 |
| Communications by Crosstalk, fax | 656 |
| none | 657 |
| none | 657 |
| none | 657 |
| Bitcom | 658 |
| none | 659 |
| none | 659 |
| Flashlink | 660 |
| Telcor T/FT | 661 |
| Telcor T/FT | 661 |
| MTEZ | 662 |
| none | 662 |
| none | 662 |
| none | 662 |
| none | 663 |
| none | 664 |
| Fax Talk Plus | 665 |
| none | 665 |
| none | 665 |
| none | 665 |
| none | 666 |
| none | 666 |
| none | 666 |
| none | 666 |

(continues on page 242)

the UNIX world. The Hayes models we've listed all speak Hayes' Express 9600 protocol, so they can get top performance when linking with the V-Series modems. CompuCom's SpeedModem Star talks CSP (CompuCom Speed Protocol) so it can hobnob with its little sibling, the increasingly popular non-V.32, 9600-baud Champ, which sells for $199. Finally, the Microcom modems support MNP 10, designed for cellular phones and *very* noisy phone lines.

## FAX AND OTHER EXTRAS

Once you've decided on protocols, the main issue is whether to get an internal or external modem. Most high-speed modems are external so they can attach to a range of computers. Other advantages of external units: They are easily moved, and they don't take up a slot in your PC. External units also include status lights that allow you to monitor modem activity and troubleshoot problems.

Internals are usually $100 to $200 cheaper than externals, are more difficult to steal, and won't clutter your desk. They should have fewer problems losing data as it passes between the modem and the PC's bus—a glitch that can occur at high speeds, especially when running multitasking software such as *Windows*. However, with an external modem you can avoid data loss with a special high-speed serial interface such as Hayes' ESP board.

Another feature to look for is built-in fax. While send-only fax is common on 2400-baud modems, the V.32 modems with fax listed here can all send *and* receive faxes at 9600 baud. Finally, we've noted a few smaller features that might affect your buying decision. A *manual volume control* lets you adjust the modem's speaker without typing awkward commands. A *power switch* means you don't have to pull the plug if you want to save power. A modem with *callback security* responds to an incoming phone call by accepting a password, hanging up, and dialing the caller back. Some modems have other extras not listed here, such as LCD displays and built-in ROM for storing phone numbers. But for most users, a good communications program will do a better job of controlling the modem and dialing calls.

Whether you download files or run software remotely, a high-speed modem is a must. Before long, you'll wonder how you ever lived without one.

*Brett Glass is a contributing editor for* PC World. *Ruth Anne Ladue provided research.*

## WHERE TO BUY

**Advanced Microcomputer Systems, Inc.**
1321 N.W. 65th Pl.
Ft. Lauderdale, FL 33309
305/975-9515,
305/975-9698 (fax)

**AT&T Paradyne**
8545 126th Ave. N
P.O. Box 2826
Largo, FL 34649-2826
800/482-3333

**ATI Technologies, Inc.**
3761 Victoria Park Ave.
Scarborough, Ontario
M1W 3S2 Canada
416/756-0718,
416/756-0720 (fax)

**Best Data Products, Inc.**
9304 Deering Ave.
Chatsworth, CA 91311
800/632-2378 (outside CA),
818/773-9600,
818/773-9619 (fax)

**Cardinal Technologies, Inc.**
1827 Freedom Rd.
Lancaster, PA 17601
800/233-0187,
717/293-3055 (fax)

**CMS Enhancements, Inc.**
2722 Michelson Dr.
Irvine, CA 92715
714/222-6000,
714/549-4004 (fax)

**CompuCom Corp.**
1180 J Miraloma Way
Sunnyvale, CA 94086
800/228-6648,
408/732-4570 (fax)

**Computer Peripherals, Inc.**
667 Ranch Conejo Blvd.
Newbury Park, CA 91320
800/854-7600,
805/499-5742 (fax)

**CXR/Anderson Jacobson**
521 Charcot Ave.
San Jose, CA 95131
800/537-5762,
408/435-1276 (fax)

**DataTrek Corp.**
4505 Wyland Dr. #400
Elkhart, IN 46516
219/522-8000,
219/522-0822 (fax)

**Digicom Systems, Inc.**
188 Topaz St.
Milpitas, CA 95035
800/833-8900,
408/262-1390 (fax)

**Dowty Communications, Inc.**
9020 Junction Dr.
Annapolis Junction, MD 20701
800/227-3134,
301/317-7220 (fax)

**E-Tech Research, Inc.**
3525 Ryder St.
Santa Clara, CA 95051
800/328-5538 (outside CA),
408/730-1388,
408/730-2488 (fax)

**Everex Systems, Inc.**
48431 Milmont Dr.
Fremont, CA 94538
800/628-3837,
510/651-0728 (fax)

**FastComm Communications Corp.**
45472 Holiday Dr.
Sterling, VA 22170
800/521-2496

**Forval America, Inc.**
6985 Union Park Center #425
Midvale, UT 84047
800/367-8251,
801/561-8777 (fax)

(continues)

## HIGH-SPEED MODEMS

| Manufacturer | Product | Price | Warranty (years) | Interface | V.32 | V.32bis | Other protocols | Fax | Power switch | Volume control switch | Callback security |
|---|---|---|---|---|---|---|---|---|---|---|---|
| U.S. ROBOTICS | Sportster V.32 | $649 | 5 | external | Y | N | none | N | Y | Y | Y |
| | Sportster V.32 (internal) | $595 | 5 | ISA | Y | N | none | N | N | N | Y |
| VEN-TEL | Ven-Tel 9600 Plus | $699 | 5 | external | Y | N | none | N | Y | N | Y |
| | Ven-Tel 9600 Plus II | $899 | 5 | external | Y | N | none | N | Y | N | Y |
| | Ven-Tel PCM9600 Plus | $675 | 5 | ISA | Y | N | none | N | N | N | N |
| WESTERN DATACOM | 532/42bis | $695 | 1 | external | Y | Y | none | N | Y | N | N |
| | 532/42i | $595 | 1 | ISA | Y | Y | none | N | N | N | N |
| X-ALT | V.42bis Probe | $399 | 2 | external | Y | Y | none | N | Y | Y | Y |
| ZERO ONE NETWORKING AND COMMUNICATIONS | ZyXEL U-1496 | $650 | 3 | external | Y | Y | none | Y | Y | N | Y |
| | ZyXEL U-1496B | $449 | 3 | ISA | Y | Y | none | Y | Y | N | N |
| | ZyXEL U-1496E | $469 | 3 | external | Y | Y | none | Y | Y | Y | N |
| ZOOM TELEPHONICS | Zoom/Modem V.32 Turbo | $599 | 2 | external | Y | N | none | N | Y | N | N |
| | Zoom/Modem V.32 Turbo PC | $599 | 2 | ISA | Y | N | none | N | N | N | N |

**For more information about all products in this table, circle reader service no. 903.**

### WHERE TO BUY

*(continued)*

**Galaxy Networks, Inc.**
8921 De Soto Ave.
Canoga Park, CA 91304
818/998-7851,
818/998-1758 (fax)

**Gandalf Systems Corp.**
Cherry Hill Industrial Center #9
Cherry Hill, NJ 08003-1688
609/424-9400,
609/751-4370 (fax)

**General DataComm, Inc.**
1575 Straits Tnpk.
Middlebury, CT 06762
800/432-2228,
800/642-1023 (fax)

**GVC Technologies, Inc.**
99 Demarest Rd.
Sparta, NJ 07871
201/579-3630,
201/579-2702 (fax)

**Hayes Microcomputer Products, Inc.**
P.O. Box 105203
Atlanta, GA 30348
404/441-1617,
404/449-0087 (fax)

**Intel Corp.**
CO3-07, 5200 N.E. Elam Young Pkwy.
Hillsboro, OR 97124-6497
800/538-3373,
503/629-7000

**Maya Computer Co.**
P.O. Box 680
Bridge St. Marketplace
Waitsfield, VT 05673
800/541-2318,
802/496-8110 (fax)

**Micro Integrated Communications Corp. (MiCC)**
3255-3 Scott Blvd.
Santa Clara, CA 95054
408/980-9565,
408/980-9568 (fax)

**Microcom, Inc.**
500 River Ridge Dr.
Norwood, MA 02062
800/822-8224,
617/551-1968 (fax)

**MicroGate Corp.**
9501 Capital of Texas Hwy.
Austin, TX 78759
800/444-1982,
512/343-9046 (fax)

**Motorola Codex**
20 Cabot Blvd.
Mansfield, MA 02048-1193
508/261-4000

**Multi-Tech Systems, Inc.**
2205 Woodale Dr.
Mounds View, MN 55112
800/328-9717 (outside MN),
612/785-3500,
612/785-9874 (fax)

**NEC America, Inc.**
Data and Video Communication Systems Division
110 Rio Robles
San Jose, CA 95134
800/222-4632,
408/433-1241 (fax)

**Octocom Systems, Inc.**
255 Ballardvale St.
Wilmington, MA 01887
508/658-6050,
508/658-0376 (fax)

**Penril DataComm Networks**
1300 Quince Orchard Blvd.
Gaithersburg, MD 20878
800/473-6745,
301/921-8376 (fax)

**Practical Peripherals, Inc.**
31245 La Baya Dr.
Westlake Village, CA 91362
800/442-4774,
818/706-2474 (fax)

**Prometheus Products, Inc.**
9524 S.W. Tualatin Sherwood Rd.
Tualatin, OR 97062
800/477-3473 (outside OR),
503/692-9600,
503/691-1101 (fax)

**Racal-Datacom, Inc.**
1601 N. Harrison Pkwy.
Sunrise, FL 33323-2899
800/722-2555,
305/846-4942 (fax)

**Star Logic, Inc.**
238 E. Caribbean Dr.
Sunnyvale, CA 94089
408/747-0903,
408/747-0954 (fax)

**Supra Corp.**
7101 Supra Dr. SW
Albany, OR 97321
800/727-8772,
503/967-2400

**Swan Technologies**
3075 Research Dr.
State College, PA 16801
800/468-9044,
814/237-4450 (fax)

**Telcor Systems Corp.**
4 Strathmore Rd.
Natick, MA 01760
800/826-2938,
508/651-0065 (fax)

**Telebit Corp.**
1315 Chesapeake Terr.
Sunnyvale, CA 94089
800/835-3248,
408/734-3333 (fax)

**Teleglobe**
600 McCaffrey St.
Montreal, Quebec H4T 1N1 Canada
514/738-4781,
514/738-4436 (fax)

**Telenetics Corp.**
2491 E. Orangethorpe Ave.
Fullerton, CA 92631
714/738-8092,
714/738-4565 (fax)

**UDS/Motorola**
5000 Bradford Dr.
Huntsville, AL 35805
800/451-2369,
205/830-5657 (fax)

**U.S. Robotics, Inc.**
8100 N. McCormick Blvd.
Skokie, IL 60076

| Bundled software | Reader service number |
|---|---|
| none | 667 |
| Communications by Crosstalk | 667 |
| Crosstalk Communicator | 668 |
| Crosstalk Communicator | 668 |
| Crosstalk Communicator | 668 |
| none | 669 |
| none | 669 |
| none | 670 |
| Zfax | 671 |
| Zfax | 671 |
| Zfax | 671 |
| none | 672 |
| Qmodem | 672 |

800/342-5877,
708/982-5235 (fax)

**Ven-Tel, Inc.**
2121 Zanker Rd.
San Jose, CA 95131
800/538-5121,
408/436-7451 (fax)

**Western Datacom**
P.O. Box 45113
Westlake, OH 44145
800/262-3311,
216/835-9146 (fax)

**X-Alt, Inc.**
42 Digital Dr.
Novato, CA 94949
800/899-9258,
415/883-9628 (fax)

**Zero One Networking and Communications**
4920 E. La Palma Ave.
Anaheim Hills, CA
92807
800/255-4101,
714/693-0705 (fax)

**Zoom Telephonics**
207 South St.
Boston, MA 02111
800/666-6191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Sunnyvale, California 94086
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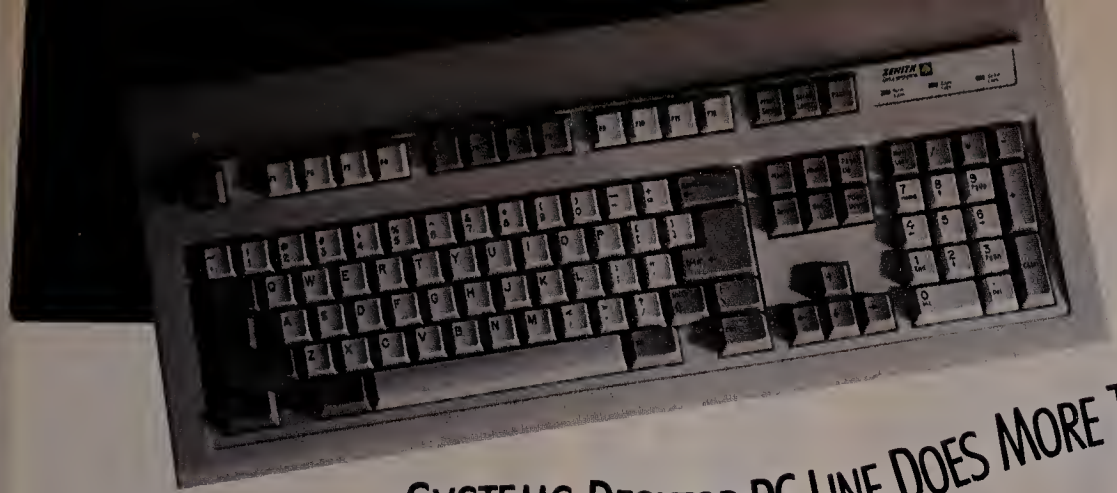

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Z-486SX/20E

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|---|---|---|---|---|---|
| **Microprocessor** | i386™SX – 20/10 MHz | i486™SX – 20 MHz | i486DX – 33 MHz | i486DX – 33 MHz | i386SX – 16 MHz |
| **Co-Processor** | Optional 80387SX | Weitek 4167 socket i486DX upgrade | Weitek 4167 socket | Weitek 4167 socket | Optional 80387SX |
| **Memory (Std./Board Max.)** | 2MB/16MB | 4MB/32MB | 4MB/64MB | 8MB/64MB | 1MB/8MB |
| **Expansion Slots** | 4 open 16-bit ISA | 3 open 32-bit EISA | 3 open 32-bit EISA | 8 open 32-bit EISA | 2 open 16-bit ISA |
| **Hard Disk Drive** | 40MB or 80MB IDE | 80MB or 200MB IDE | 200MB or 400MB IDE | 340MB half-height SCSI; 6 open half-height bays | Diskless; 40MB IDE optional |
| **Ports** | 2 serial, 1 parallel | 2 serial, 1 parallel | 2 serial, 1 parallel | 2 serial, 2 parallel, 1 mouse | 2 serial, 1 parallel |
| **Disk Drive Controller** | Combined IDE connector/ floppy controller | Combined IDE connector/ floppy controller | Combined IDE connector/SCSI/ floppy controller | EISA bus master SCSI mass host adapter | IDE connector/ floppy controller |
| **Video** | 16-bit VGA card | 16-bit VGA card | TIGA/VGA | 16-bit VGA card | 16-bit VGA on board |
| **LAN Features** | | | | Optional RAID 5 disk array software | Dual level ROM-based password protection |

Z-486/33E

Novell Labs Tested & Approved™

* The Z-486/33ET has been tested for compatibility with Novell NetWare® and Microsoft LAN Manager.™
The Z-486/33ET has been submitted for testing and compatibility with Banyan® VINES™ and SCO™ and ISC™ UNIX.®

Z-486/33ET and Z-LS

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# GATEWAY VS. COMPAQ

Four experienced PC users explain the pros and cons of buying systems from the David and Goliath of IBM compatibles: the mighty Compaq and its challenger Gateway.

Although Compaq is a giant in the PC-compatibles industry, fast-growing Gateway has targeted Compaq's weak spot—higher prices—and become a tremendous success with its low-cost systems and responsive service.

This month's road testers have spent months working with these competitors' 20-MHz 386SX systems—today's commodity desktops. In evaluating the systems, our road testers were sensitive to price, but they believed that the true test of long-term customer satisfaction is vendor service and support. Like the majority of people who use PCs on the job, they can't afford any downtime.

## GATEWAY 2000 386SX-20C

**Michael McDaniel** *is in charge of microcomputer and communications support for his company's nationwide sites.*

I was a little nervous at first about purchasing from a mail-order vendor, but I went ahead and bought two of the Gateway machines for our company. What initially caught my attention was Gateway's free on-site TRW repair service for a full year after purchase. They even gave us a discount beyond the advertised price when I explained that our company had to spend conservatively. Not bad for a mail-order firm that already offers low prices.

ALICE LAPLANTE

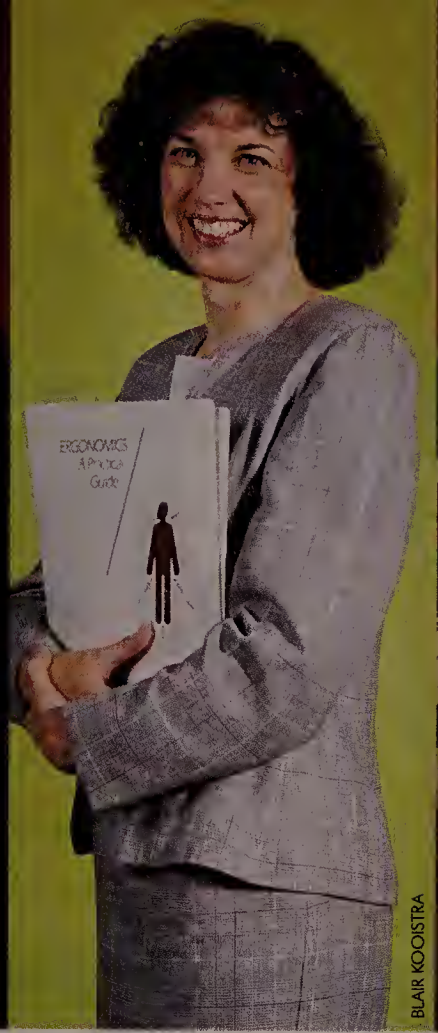
The only disadvantage to Gateway's support is that at first I had to go through a regular tech support line. They eventually gave me a different number to call as a corporate account, and now my questions are answered more quickly.

The computer's programmable keyboard is an especially nice feature: I programmed a key to automatically log me on to the LAN, which saves about 5 minutes. We've had some problems with the systems—mostly interrupt conflicts that were easily solved. One hard drive had to go back. I was impressed, though, by the absence of BIOS or compatibility problems. The systems are designed so you can easily get inside to service them.

**Linda Graebel** *uses her Gateway computer to handle the bookkeeping and correspondence for her occupational and physical therapy practice.*

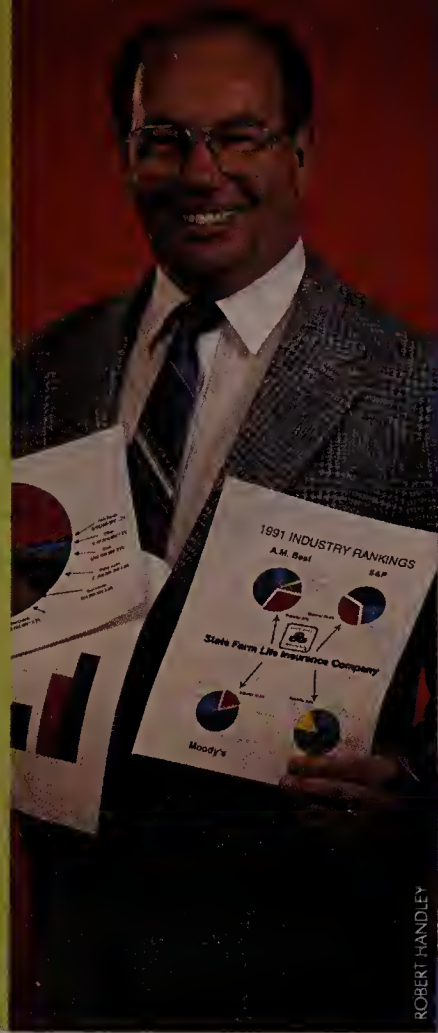
MARTY KATZ

**BRUCE BINDON**
**Position: LAN administrator**
**Company: Heery Program Management, a construction firm based in Baltimore**
**Hardware: 5MB RAM, 120MB hard drive**
**Software: *1-2-3, WordPerfect, Paradox, Primavera Project Planner, Freelance Plus, PageMaker***




BLAIR KOOISTRA

**LINDA GRAEBEL**
**Position: President**
**Company: Graebel & Associates Industrial Health and Rehabilitation, Spokane, Washington**
**Hardware: 4MB RAM, 80MB hard drive**
**Software: *DacEasy Accounting, WordPerfect, 1-2-3, Windows 3.0, Norton Commander,* patient-billing application for Washington State**




ROBERT HANDLEY

**BILL ANGELL**
**Position: Staff assistant**
**Company: State Farm Life Insurance, Bloomington, Illinois**
**Hardware: 6MB RAM, 120MB hard drive**
**Software: *Ventura, Harvard Graphics, Charisma, 1-2-3***

STEVE JENNINGS

**MICHAEL McDANIEL**
**Position: Communications administrator**
**Company: Natco, a petroleum-vessels manufacturer in Tulsa, Oklahoma**
**Hardware: 4MB RAM, 80MB hard drive**
**Software: *WordPerfect, 1-2-3, Windows 3.0, dBASE III, Paradox,* proprietary Natco engineering and vessel applications**

When I first got my Gateway computer, the monitor was dead on arrival. I needed the computer immediately because my other computer had gone down. I found Gateway's service quite accommodating; they shipped out another monitor the next day. I haven't had any other problems with the system.

The price was good, but price isn't everything. You have to be able to rely on the company if something goes wrong. That's why I was happy with Gateway's response to the bad monitor. Their service and support have been excellent.

## COMPAQ DESKPRO 386S/20

**Bill Angell** *uses his Compaq system to create charts for insurance analyses and to train other PC users in his department on graphics packages.*

We're almost a straight IBM shop in this department, but I needed an industry-standard machine that could hook up to an 8-inch Bernoulli drive, and PS/2s weren't compatible at the time. Buying any machine other than an IBM or a Compaq was out of the question. In a big company like this, standardization is important because you have to swap components. We've bought several of these Compaq models, and I can't say I see a big difference from the quality of IBM machines.

This model's a little pricey, or at least it was when I bought it a year ago. It's come down in price since then, but comparatively speaking it's still on the expensive side.

We've never had to go to Compaq for service or support—we've always worked with our dealer, who's provided excellent service. But I think it's a definite improvement that you can now call Compaq directly for support if you want to.

**Bruce Bindon's** *company primarily uses Compaqs. He uses his computer to do data base management and desktop publishing.*

My company has had few compatibility problems with Compaq systems, which is important because we're on a Novell NetWare LAN and connectivity is essential.

I've had minor problems with Compaq machines over the past year. Not with this particular machine, though. I've had this one for 10 months, but problems generally don't surface for 14 to 16 months. Still, I was impressed with the company's response to something I mentioned on an owner registration

## REPORT CARD

| | Gateway 2000 386SX-20C | | Compaq Deskpro 386s/20 | |
|---|---|---|---|---|
| | Michael McDaniel | Linda Graebel | Bill Angell | Bruce Bindon |
| Performance | A | A | A | A |
| Fast RAM | * | * | * | A |
| Expandability | B | A | B | C |
| Design/construction | A | A | A | B |
| Reliability | A | B | A | B |
| Price | A | A | C | B+ |
| Service/support | A | A | A | A |
| Overall | A- | A- | A- | B+ |

*User did not use feature or test it fully.

card I returned. I said that I'd had problems with Compaq, and the company told me that they'd honor a warranty extension if I had problems in the future with a machine after its warranty had expired.

Compaq should really upgrade the keyboard. We swap in IBM keyboards for Compaq keyboards whenever we can.

*Alice LaPlante is a writer in Palo Alto, California.*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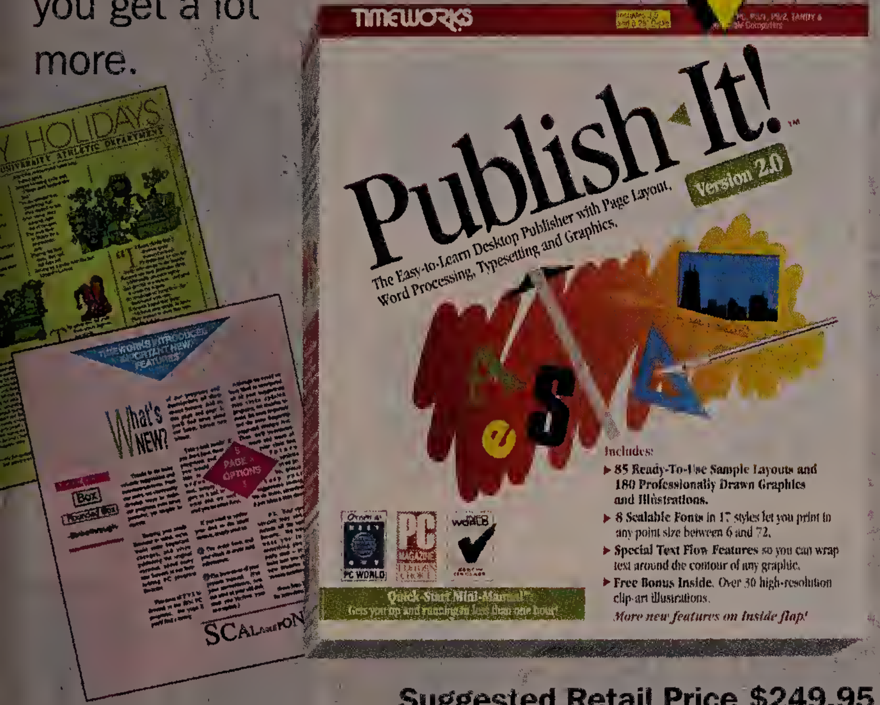


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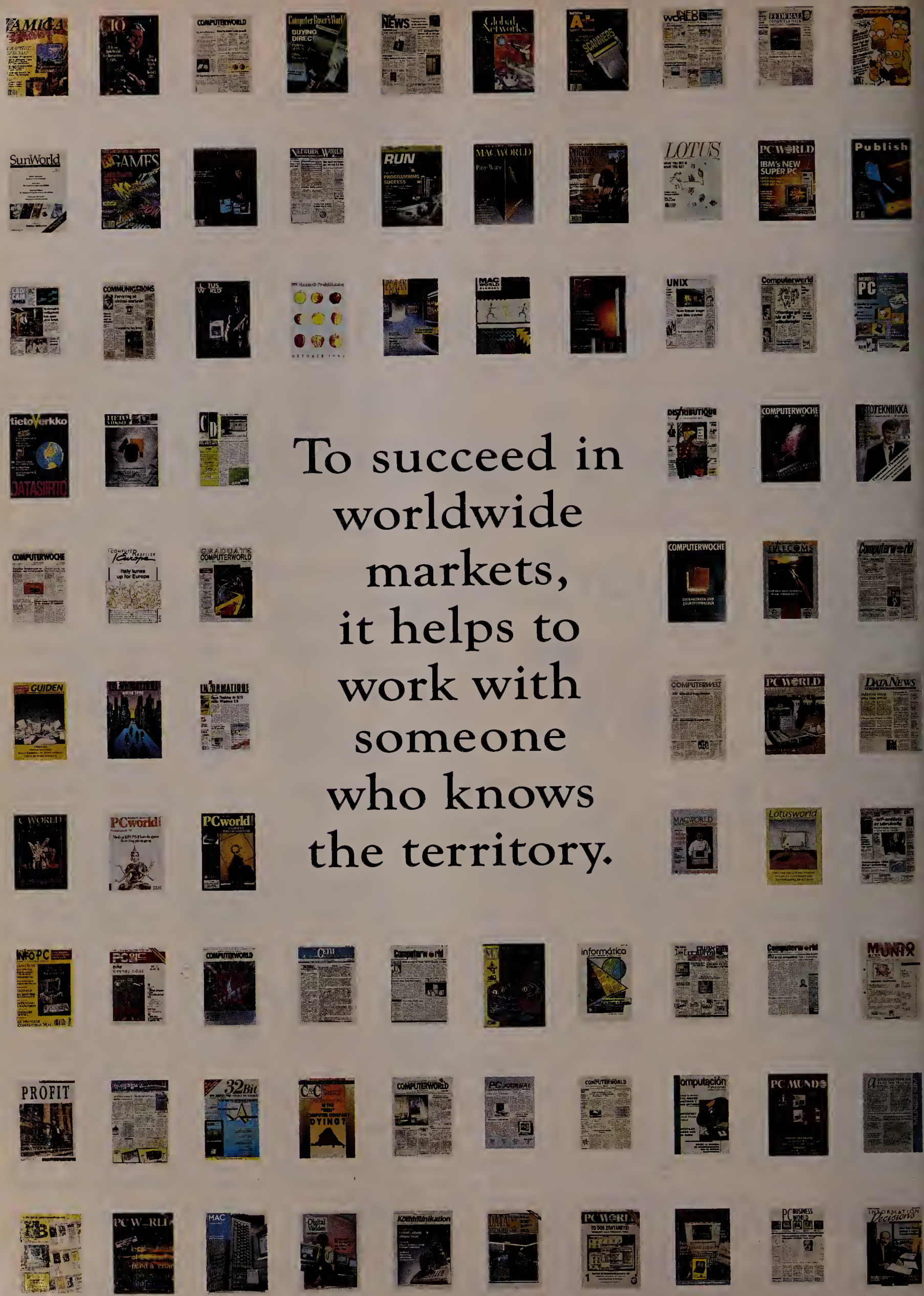


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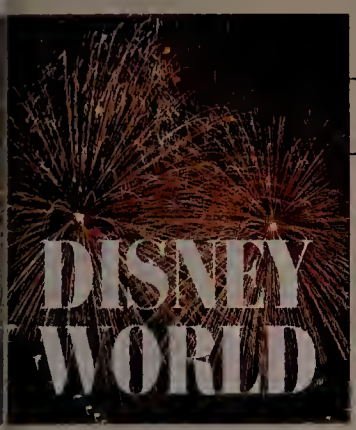


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| ☐ Windows | ☐ 5.25 inch |

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# FORECAST 1992

**If you think the industry has run out of surprises, think again. A renowned PC industry analyst predicts that 1992 will be a banner year.**

It's that time again—time to throw out the 1991 calendar and start planning for the year to come. 1992 promises to be a banner year for the PC buyer, who will be presented with an array of choices from a tempting banquet of new hardware and software. Depending on your situation, you can view this with alarm—"Again? So soon?"—or as a great opportunity—"Look at all this new stuff! And look at the wonderful prices!"

1991 was a year in which companies and strategies held center stage. IBM and Apple joined forces; Microsoft and IBM took the gloves off; Borland swallowed Ashton-Tate. All this was good for journalists, but frustrating for users. While expectations soared, deliverables seemed somewhere off in the distance.

But my crystal ball tells me that many long-promised products will finally become available in 1992. The biggest offerings will occur in four product areas: smaller, lighter, and more powerful portable computers; realistic color imaging tools; easier network solutions; and friendlier *Windows* and OS/2-based software.

## BETTER PORTABLES

1992 will be a busy year for hardware, with more powerful 386, 486, and RISC-based systems for the desktop and carrying case. In fact, because portables already equal desktop devices in speed, power, and storage, 1992 may be the crossover year when we start buying more portable PCs than desktop ones.

As portables' speeds approach 33 MHz and prices for 386 clones drop to $2000 or less, look for more powerful 486—perhaps even 586—desktop PCs and featherweight portables with longer battery life or color VGA screens. Every systems vendor will be competing for your dollars, so portables' prices should fall.

Finally, you'll see more pen-based computers than you can shake a stick at, all priced in the $4000 to $5000 range and aimed mostly at

AMY WOHL

PC WORLD

BUDGETOPOLY

## CEO'S OFFICE

Did you make appointment with Executive Secretary? If not, go back one office. If you have an appointment, roll. 1-5 = if over budget, go back to Boardroom; if on or under budget, you win your raise. 6 = Good Ol' Dave, the new CEO, fires you for suggesting his job be eliminated, **game over.**

## EXECUTIVE SECRETARY

Roll to make appointment with CEO. 1-4 = enter with caution; 5 = CEO out of town, go back to Senior VP; 6 = fire drill, take stairs to third-floor terrace.

## SENIOR VP

Senior VP says you must use capital expense allotment by quarter's end. Roll: 1-3 = vendor offers better terms for quick deal, cut $3000 from estimate, 4-6 = less time to shop around for best deal, add $3000 to estimate.

6

## LEGAL

Legal goes over contract, notes it doesn't stipulate terms of payment. Add $2000 to estimated expenditure; take stairs down one floor to Boardroom.

## CFO'S OFFICE

All capital expense requests now go through new CFO, who doesn't understand computers. **Lose a turn.**

5

## ACCOUNTING

Head of Accounting says $5000 in capital expenses can be deferred to next fiscal year. **Subtract $5000 from estimate.**

## SALES

Keiko in Sales has same 9600-baud modem you chose. Find out it comes with a lifetime warranty. After a long lunch, take the elevator up one floor to CFO.

## BOARDROOM

Roll: 1-3 = vendor's reference okay, cut $3000 from estimate, 4-5 = CFO resigns after investing company funds in BCCI, go to Water Cooler on fourth floor to gossip. 6 = Boss insists new PCs be installed Saturday, add $1000 to estimate for time-and-a-half.

## MARKETING

Sheila says you can't check out scanner without approval of Marketing VP, who's not in. **Lose a turn.**

## BOSS'S OFFICE

Boss wants to know whose job can be eliminated by installing new systems. Suggest Good Ol' Dave's. "Good idea," says Boss. Take stairs down to Water Cooler on fourth floor for aspirin.

4

## WATER COOLER

Run into Good Ol' Dave again, who's still whining about his job.

## MIS

MIS requires that all new desktop systems meet parity memory requirement. **Add $3000 to estimate.**

## THE OTHER BOB'S OFFICE

Other Bob suggests checking out Marketing's scanner. Take elevator to Marketing on fifth floor.

## BOB'S OFFICE

Bob says outside service firm gives better, cheaper tech support than vendor. Subtract $4000 from estimate.

## DEPT. ASST.

Calls to five vendors indicate you under-estimated costs. Roll: 1-3 = add $3000 to estimate; 4-6 = write memo suggesting department drop color printer.

THIRD-FLOOR TERRACE

**KITCHEN**

Read PC World during lunch. Street prices show you can come in under budget for 386s. Subtract $2000 from estimate.

**LOUNGE**

Overhear Howie saying if you don't come in 20 percent under budget, you'll be fired. Break into cold sweat. **Lose a turn.**

**RESEARCH**

Vendor offers $6000 off price for ten PCs and one year unlimited support if you pay up front. Subtract **$6000 from estimate and go to third-floor terrace for break.**

**SHANDRA'S OFFICE**

Roll: 1-2 = Shandra thinks you've lowballed on the 386s, add $3000 to estimate; 3-4 = Shandra's on vacation, go next door for Steve's advice; 5-6 = Shandra needs a day to check your work, roll again.

**STEVE'S OFFICE**

Steve says proposal needs reorganizing. Go downstairs with him to second-floor Conference Room.

**REST ROOM**

Decide to ask Shandra to eyeball your preliminary proposal. Take elevator to her third-floor office.

**COPY/FAX MACHINE**

Vendor fax says price of hard disks has dropped. **Cut $1500 from estimate.**

**CONFERENCE ROOM**

Roll: 1-3 = endless committee meeting, lose a turn. 4-5 = budget meeting postponed, go to terrace. 6 = CEO's birthday; all meetings canceled, **roll again.**

**GRAPHICS**

Jose the graphics whiz confirms that department needs one full-page monitor for desktop publishing. **Add $1000 to estimate.**

**PERSONNEL**

Good news: New employee for FY 92 approved for your department. Bad news: Add $4000 to estimate for additional hardware.

**RECEPTION**

START

Good morning! Your boss left you a memo. Read it and get to work.

**HOWIE'S OFFICE**

Howie spreads rumor about reorganization. Gain 20 gray hairs; return to Reception for listening to idle gossip.

**GOOD OL' DAVE'S OFFICE**

Good Ol' Dave collars you in the hall, spends half an hour complaining about his job.

**MANUFACTURING**

George says local superstore is great resource for modems and fax boards. Lower estimate by $1500 and take elevator to second-floor Conference Room.

**MAIL ROOM**

PC World arrives in mail. Read that low-cost 486SX machines will be available in Q2 1992. Substitute five 486SXs for proposed 386s and **cut $1000 from estimate.**

brave, early adopters in the sales force. Most of the applications for pen-based computers will be ports of existing programs. It may be a while before we see innovative software that converts handwritten notes to ASCII, provides instant information, and appeals to new classes of formerly computer illiterate users.

## SEEING IS BELIEVING

All of us who were raised on color TV are also hungry for photo-realistic color in multimedia applications ranging from presentation management to videoconferencing. Unfortunately, it's tough for anything but a fast 386 or 486 to handle the data that makes up such an image. But as you upgrade your systems to 386s and higher during 1992, you may find the platform you need to process color bitmapped images, create animation effects, and incorporate video sequences.

More models with built-in CD ROM will arrive this year, so retrieving large color images for multimedia applications will be cheaper and easier. By the mid-1990s, rewritable optical storage (or its successor) will be a standard peripheral, and multimedia applications that include photo-realistic images will be part of everyday life.

In the meantime, look for a lot of fancy new peripherals. There will be more color scanners priced as low as $1500, and suitable graphics software like Software Publishing Corporation's *Harvard Graphics* and Lotus's *Freelance.* And with much more variety in low-priced, 300-dpi color printers, color output will markedly improve.

## LAN LAUNCHES

In the more mobile society of 1992, you'll need to be concerned about dialing in to the network from remote locations and integrating the information in the office systems with the system in your briefcase.

Packages such as Farallon Computing's *PhoneNet* will make it easy to plug in your roving portable; products such as *FastLink* will let you maintain and update information between your desktop and your portable; and notebook computers from companies such as Grid Systems will incorporate radio and cellular telephone technology.

You'll also see new approaches to LAN systems software, starting with Novell's plan to integrate NetWare with its newest acquisition, the highly acclaimed DOS clone *DR DOS.* This will result in LAN software that's easier to use and a LAN environment that's easier to manage.

**In 1992, prices will drop, vendors will form alliances at an alarming rate, and products will appear and disappear overnight.**

Finally, 1992 will be a big year for software that supports work groups, like Lotus's *Notes.* Groupware and LANs together create a whole new kind of work environment, where you can readily share information and keep track of deadlines with all your coworkers.

## FRIENDLIER INTERFACES FOR EVERYONE

The main body of new and upgraded *Windows* software ships in 1992. If IBM gets its wish, these packages, as well as new OS/2 applications, will run smoothly on OS/2 2.0.

As a result of the growing acceptance of *Windows,* DOS users will crave a better interface. This is good news for vendors of DOS shells such as BrightBill-Robert's *Hyperpad* or Quarterdeck's *DesqView,* and better news for DOS users who want something more malleable than old-fashioned DOS.

We'll also see products that make it easier to manage files. With *Windows 3.1* shipping, OS/2 2.0 superseding *Presentation Manager,* and products such as Symantec's *Norton Utilities for Windows* safely installed, your staff will be able to navigate through their systems with much less training. And the graphical user interfaces of products such as Coordination Technologies' *Together* and Xerox's *Rooms* will offer new ways of thinking about and doing tasks, especially those involving joint deadlines and shared information.

New interfaces that ship with pen, voice, and video hardware will also be arriving in 1992, so learning new systems will be faster and easier. Interfaces that incorporate voice recognition, such as Go Corporation's PenPoint system, will have on-screen "buttons" with familiar stereo controls, making it possible for people who don't type to use computers easily. The built-in interface in pen-based systems will understand writing gestures like checking, circling, and crossing out. And video-based applications for creating multimedia presentations, such as *Digital FX* and MacroMind's *Action,* will use film and TV metaphors.

## IT'S HOW YOU PLAY THE GAME

In the increasingly competitive market of 1992 prices will constantly drop, vendors will form new alliances at an alarming rate, and products will appear and disappear overnight.

So how can you make the best purchase decisions in 1992? By understanding the rules of the game. This is a game where what you pay depends not on the physical product you're buying but on a combination of knowledge about the product, where you buy it, and how much service and support you want. With that knowledge, you can buy smart and pay for exactly what you need.

*Amy Wohl is an industry analyst based in Bala Cynwyd, Pennsylvania. She is also editor of* TrendsLetter, *a PC industry newsletter.*

# BUDGETOPOLY

## The Game of Getting the Hardware You Need with the Money You Have

### INSTRUCTIONS

Guess what. You have been chosen to recommend the department's 1992 hardware purchases. Fifteen of your staff have requested *Windows*-ready 386s. You'll also want to get bids on a new network laser printer, a color printer, a color scanner, seven 9600-baud modems, seven fax boards, and a new 486 server, but your research may reveal other needs.

The CFO has given you a budget limit of $100,000 for these items. If you manage to negotiate deals under this amount, get terrific support for all the hardware, and cost-justify your recommendations, the CEO will approve your raise. If not, you can kiss your raise goodbye.

To play: Using a coin as a marker, start in Reception, roll one die, and advance that number of spaces. Follow the instructions posted in each area as you enter. (Once you reach Accounting, you may roll a higher number than you need to reach the CEO; in that case, proceed to the CEO's office and follow instructions.)

Start with a $100,000 estimate, and revise as you go; tally estimates on a piece of scratch paper. The first player to reach the CEO's office at or under $100,000 wins.

Good luck!

**By Bronwyn Fryer and Steve Fox**
**Design and Illustration by Gordon Studer**

PC WORLD

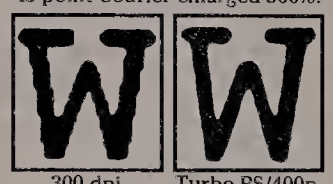
BUDGETOPOLY

# It doesn't take a rocket scientist to figure it out. But one did.

Quite a few scientific types focused on the heavens above have found that NewGen™ high-resolution, PostScript®-compatible printers offer advances found nowhere else on earth.

Like Image Enhancement Technology (IET)™, for character quality that's out of this world. Plus Automatic Recognition Technology (ART)™, to select the right interfaces and emulations for you. And Program Updating with the latest in controller technology to make your NewGen printer virtually obsolescence-free.

Resolution close up,
13 point Courier enlarged 500%.



300 dpi Turbo PS/300p — Turbo PS/400p with IET

Yet, for all their innovation, you'll find they're offered at very down-to-earth prices.

Take our TurboPS Pro Series, delivering incredibly crisp, professional documents and superb performance at up to 800x400 dpi for single and work group users alike.

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Then there's the new T Series, with exceptional 1200x600 dpi in 11"x17" format for truly outstanding graphics capability.

You can add a second paper tray, IC memory cards, SCSI interface and other options as you like.

And with NewGen, you can count on solid customer and technical support as well.

All of which makes NewGen a leader in the printer technology race.

To learn more, or for your local NewGen Dealer, call today. We'll be happy to help you decide which of our machines is just right for your mission.

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**End User Inquiries**
**Circle 158 on reader service card**
**For Dealer Inquiries**
**Circle 159 on reader service card**

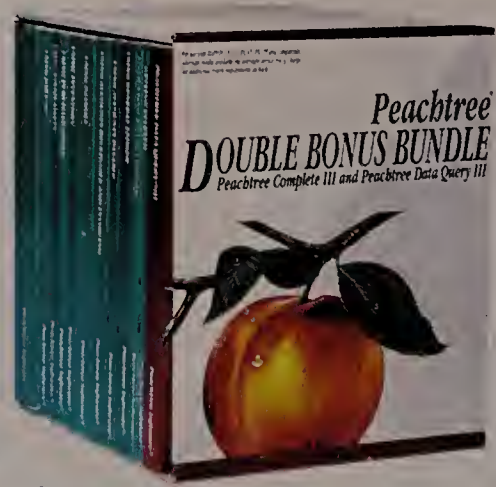
# PEACHTREE ACCOUNTING MAKES EVERY PENNY COUNT.

When you're running your own business, every financial decision is an important one. Make sure you're getting the most out of your business dollar with the best value in accounting software, The Peachtree Double Bonus Bundle ■

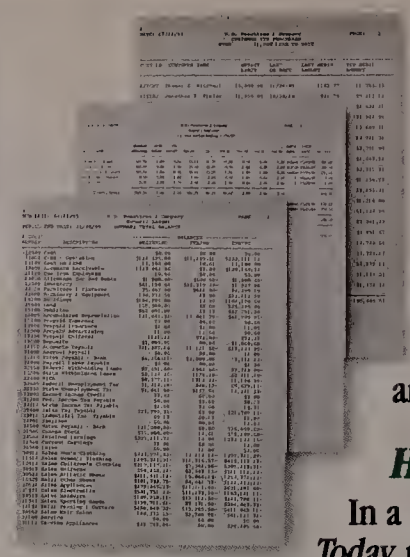
Peachtree Software has been the leader in accounting software for over 13 years. Now we've combined two high-powered programs into one value-packed bundle—Peachtree Complete® III, a comprehensive accounting system, and Peachtree Data Query® III, a custom reporting and analysis tool ■

Peachtree Complete III has nine powerful modules, each loaded with features you'd expect to find in much higher priced packages:

- *General Ledger*
- *Accounts Payable*
- *Accounts Receivable*
- *Payroll*
- *Inventory*
- *Invoicing*
- *Purchase Order*
- *Fixed Assets*
- *Job Cost*

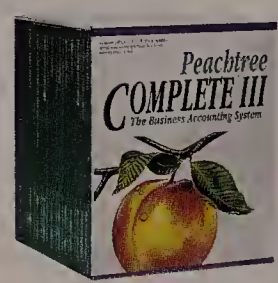



**$298**



## Easy to Use

The modular design of Peachtree Complete III makes it easy to implement the functions you need now, then add others as your business expands. Everything you need to start setting up accounts and processing your financial information is included in the package. There's a Quick-Start Guide to help you load the program, as well as a DOS and Accounting Primer plus a nine-volume reference library. Each module has on-line tutorials that help you learn accounting as you install the program, and context-sensitive HELP is available any time you need assistance ■




**$199**

## Flexible, Powerful Reporting

The management reporting capabilities of Peachtree Data Query III give you a unique view of the accounting data in your Peachtree Complete III files. Whether you choose one of the 50 pre-defined reports or customize your own, PDQ lets you get to the meaning behind the numbers with historical reports and complex analyses to give you a more complete picture of your business finances ■

With PDQ you can even read and report on data from your Lotus 1-2-3® spreadsheets, and export data to Lotus 1-2-3, dBASE® and other popular applications with no re-keying of data and no risk to your files ■

Best of all, you won't sacrifice ease of use to get the power and performance your business needs. There's an on-line tutorial in each module, so you can learn accounting as you set up your files. Context sensitive HELP is on-line at all times. Peachtree provides a thorough reference library, including a quick-start installation guide and Accounting Primer to assure that you'll be up and running quickly. Errors are handled with understandable, plain English messages and suggestions ■

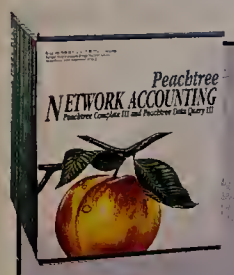
## Highly Recommended

In a recent survey by *Accounting Today* magazine, Peachtree was recommended by accountants almost twice as often as the nearest competitor. When *Reseller Management* asked resellers which accounting package they recommend, Peachtree came out on top again, with 25% of resellers recommending it ■

Most importantly, users recommend Peachtree! Based on reader response, *Computer Shopper* named Peachtree Software the Best Buy in Accounting Software for 1990, and Peachtree Complete III received the 1991 World Class Award from *PC World*. More than 400,000 small businesses trust their accounting to Peachtree ■

## We're Not Satisfied Until You Are

Convenient technical support may be purchased from Authorized Support Centers in over 80 cities across the country or through prepaid support contracts directly from Peachtree. We stand behind our products with an unconditional 60-day money back guarantee. If you aren't satisfied with your Peachtree product, simply return it within 60 days for a prompt refund ■




**Give every workstation the power of Peachtree with Peachtree Complete Network Accounting!**

Now your entire staff can access the full-featured accounting power of Peachtree Complete III plus the custom reporting capabilities of Peachtree Data Query III in one multi-user package — Peachtree Network Accounting. Multiple users may use a single module simultaneously. Most modules allow several operators to perform the same function at the same time for the same company. But don't worry—we've provided three levels of optional password security to protect your confidential accounting data. Peachtree Complete Network Accounting is available now for use with Novelle®, LANtastic™ and other NETBIOS compatible LANs. **$695**

## Call now to order

**or for the name of a dealer in your area**

**1-800-247-3224**

**or to order by Fax 404-564-5888**

**Add $12.50 shipping. In Georgia, add applicable sales tax. Telephone number required on all orders.**

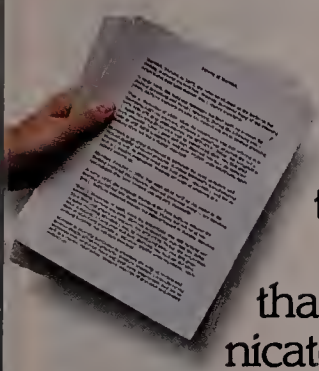
**Peachtree Software**

1505 Pavilion Place • Norcross, GA 30093

**Hardware Specifications:** Requires PC/MS-DOS version 3.1 or higher (supports DOS 5.0) with 640K of memory and a hard disk. For use with IBM® PC, PC XT, PC AT, Personal System/2™ and compatibles. Alternate media optionally available. Not copy protected. Product names referenced are trademarks and registered trademarks of their respective manufacturers.

Circle 144 on reader service card

# Microtek Presents The Self-Feeding Scanner With A Real Appetite For Words.



It has often been said that a picture is worth a thousand words.

Yet in business, it's words that we use to communicate with most often.

Which is why Microtek has developed the MS-II scanner.

DESIGNED FOR OCR & GRAPHICS

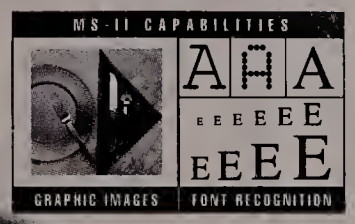
The first desktop scanner designed specifically for Optical Character Recognition (OCR).

It scans words into your computer with the same exact precision that ordinary scanners let your computer receive pictures.

The MS-II comes bundled with OmniType, a special version of Caere's award-winning OmniPage page recognition software, providing a complete OCR scanning solution.

OmniType separates text from graphics while reading nearly any non-stylized font from 6 to 72 points in size.

So instead of having to tediously retype reports, financial statements and other already printed




information, you can quickly scan them into your word processing, database or spreadsheet program. Up to fifty pages at a time.

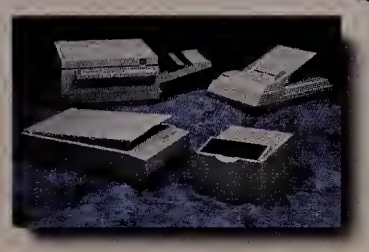
Of course, the MS-II also recognizes photos and other graphics and scans them just as accurately. Simulating 64 shades of gray.

Best of all, the MS-II is designed for limited budgets. It's just $995 if you're using an IBM PC, PS/2 or compatible. And only $1,195 if you have a Macintosh.

*PC or Mac, the MS-II scanner comes complete with Caere's OmniType OCR software.*

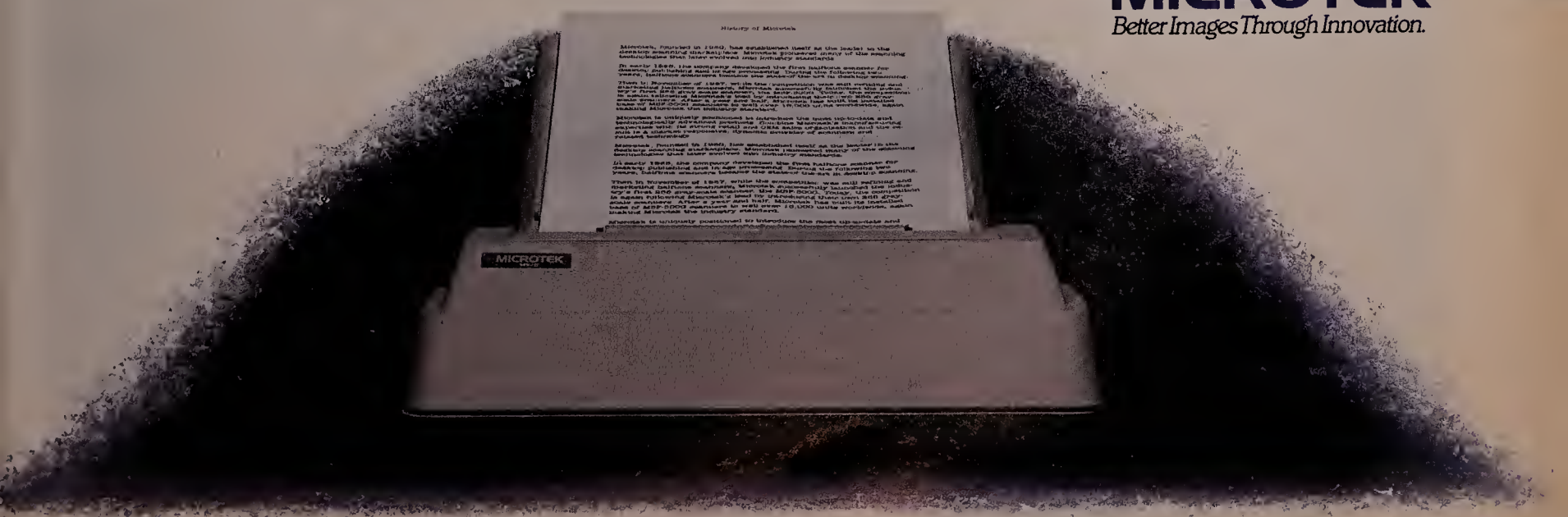
If you're working with words, you owe it to yourself to get a Microtek MS-II scanner. Call 1-800-654-4160 or in California, 213-321-2121 for the Microtek dealer nearest you.

Do it today. Because we're sure you'll agree that the MS-II's appetite for words far exceeds your appetite for typing.



*The MS-II is just one member of a whole family of innovative peripherals available from Microtek.*

**MICROTEK**
*Better Images Through Innovation.*




•Microtek Lab, Inc., 680 Knox Street, Torrance, CA 90502, (213) 321-2121 (800) 654-4160 •Microtek International, Inc., No. 6 Industry East Road 3, Science-Based Industrial Park, Hsinchu Taiwan, 30077, R.O.C., 886-35-772155 • Microtek Electronics Europe, GmbH., Schiess-Straße 72, D-4000 Düsseldorf 11, F.R. Germany, 49-211-526070 •©1991 Microtek Lab, Inc. All rights reserved. MS-II is a trademark of Microtek International, Inc. OmniType and OmniPage are trademarks of Caere Corporation. Macintosh is a registered trademark of Apple Computer, Inc. IBM and PS/2 are trademarks of International Business Machines Corporation. All other trademarks or registered trademarks are the property of their respective holders.

**Circle 162 on reader service card**

# CLONES TOP KINGPINS

**Mail-order mainstays Gateway and Dell take on the big boys at IBM and Compaq with outstanding prices, technical support, and service.**

When it comes to providing customer satisfaction, mail-order houses Dell and Gateway surpass industry kingpins IBM and Compaq. Not only do Dell and Gateway's prices and support rate highly, but their systems' reliability and performance outstrip their two major competitors'.

These are the opinions of the PC owners we surveyed by phone in September. We randomly selected a group of 100 people for each vendor, who had purchased a system (any model) from that vendor in the preceding 18 months. In rating their overall satisfaction, 95 percent of Dell customers and 88 percent of Gateway customers said they were either "extremely" or "very" satisfied—the two highest ratings on our five-point scale. Seventy-nine percent of IBM customers and 77 percent of Compaq owners rated their systems that highly.

Either Dell or Gateway also came out on top when respondents rated their systems on seven evaluation criteria. Dell scored highest on reliability, performance, technical support and service, and design. Gateway was close behind on performance and led on expandability, fast-RAM capacity, and price. Respondents also ranked the importance of these evaluation criteria. They considered reliability, performance, and technical support and service to be most important, followed by expandability, fast-RAM capacity, and price. Design and construction were least important.

More Dell and Gateway purchasers said they would buy the same brand of PC again. More Compaq customers responded that they wouldn't buy their system again.

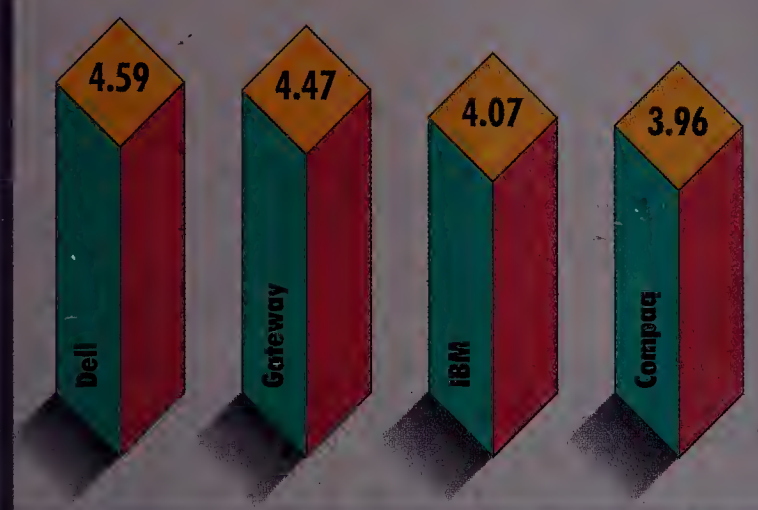
Dell purchasers who said they would buy their system again gave technical support and service, reliability, and price as their top three reasons. Price was far and away the leading reason why Gateway customers would purchase their system again, followed by technical support and service and reliability. Conversely, the reasons most often given by customers of all four vendors for not buying again were high price and poor support and service.

CHRISTINE WHYTE

*Christine Whyte is a freelance editor in San Francisco.*

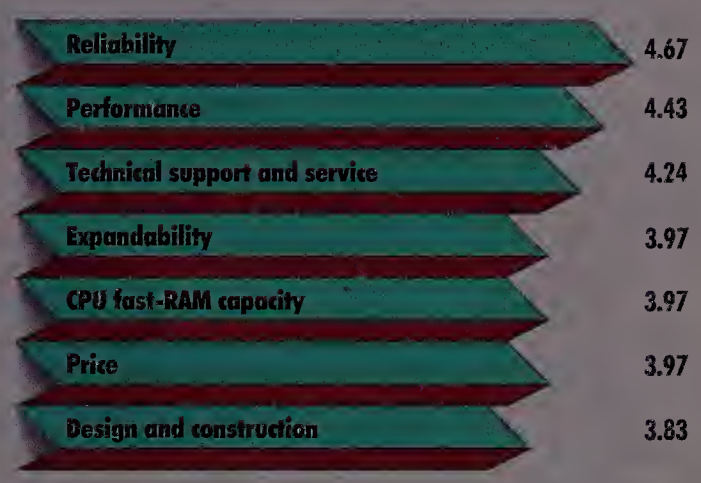
## DELL AND GATEWAY CUSTOMERS MOST SATISFIED

*Overall satisfaction with product, 5=high 1=low*




## RELIABILITY, PERFORMANCE MOST IMPORTANT

*Users rank important buying criteria, 5=high 1=low*



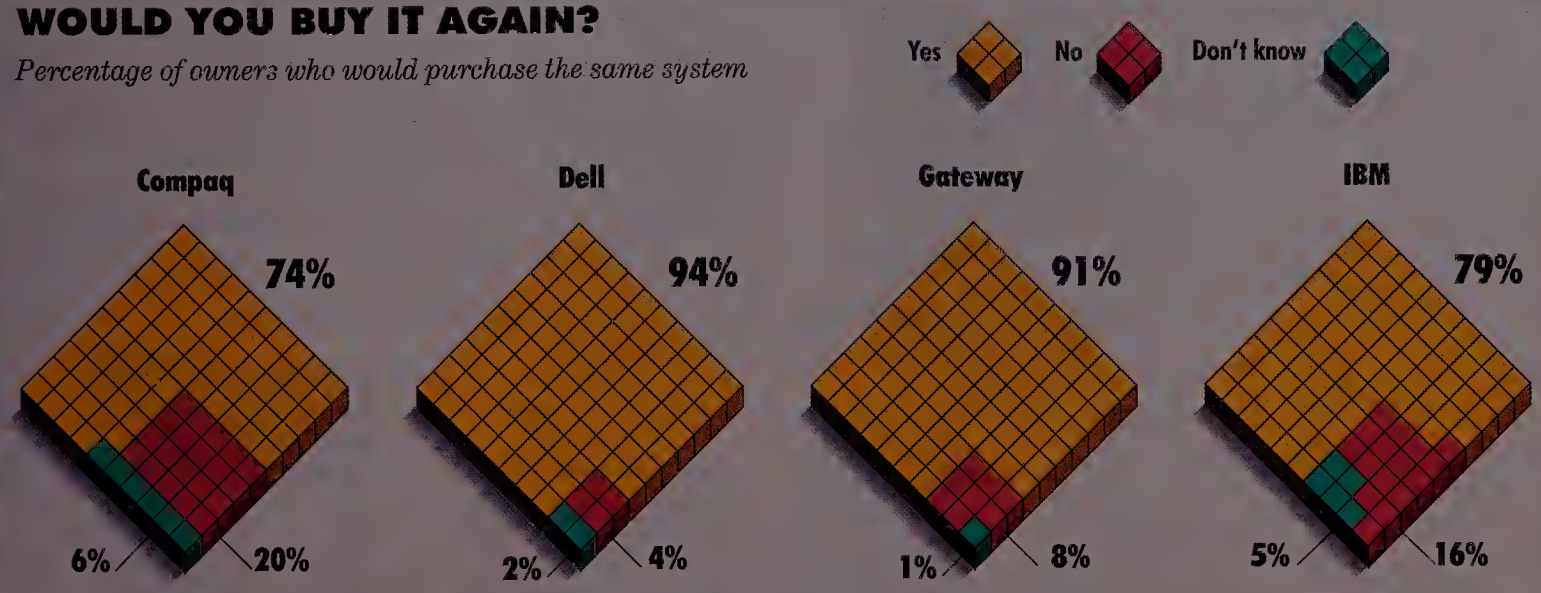

## USERS GIVE HIGH RATINGS TO CRITICAL FEATURES

*Satisfaction with key features, 5=high 1=low*

| | Overall | Compaq | Dell | Gateway | IBM |
|---|---|---|---|---|---|
| Reliability | **4.41** | 4.28 | 4.55 | 4.38 | 4.44 |
| Performance | **4.40** | 4.34 | 4.57 | 4.54 | 4.17 |
| CPU fast-RAM capacity | **4.25** | 4.32 | 4.36 | 4.41 | 3.90 |
| Design and construction | **4.18** | 4.09 | 4.40 | 4.21 | 4.02 |
| Expandability | **4.18** | 4.01 | 4.37 | 4.48 | 3.86 |
| Technical support and service | **4.02** | 3.44 | 4.44 | 4.14 | 3.96 |
| Price | **3.86** | 3.08 | 4.22 | 4.78 | 3.35 |

## WOULD YOU BUY IT AGAIN?

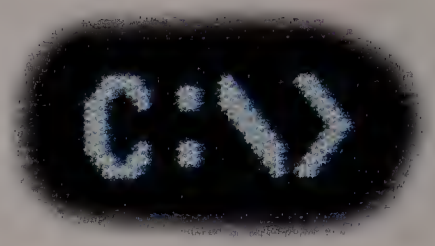
*Percentage of owners who would purchase the same system*




*Source: Data is based on a September 1991 random phone survey of 100 users each of Compaq, Dell, Gateway, and IBM systems (any model) purchased within the last 18 months. This data represents the opinions of the survey respondents.*

# IF YOU WANT TO WORK IN WINDOWS

# BUT YOU NEED TO WORK IN DOS

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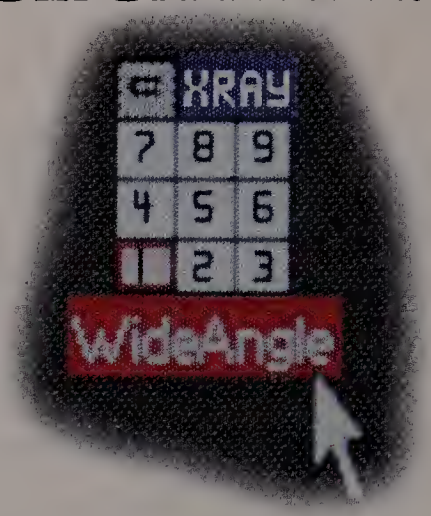
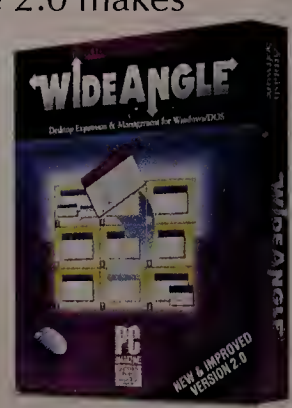



If you love Windows, but you depend on DOS, you need WideAngle 2.0™. It makes Windows and DOS work together your way - without cumbersome application switching, window shuffling or desktop clutter. WideAngle 2.0 expands your windowing desktop to nine screen-sized workspaces, each of which holds multiple Windows applications or a DOS program. To go from one workspace to another, simply click on the interactive Power Ike™ icon, or use WideAngle's equally powerful hot keys. Click on XRAY View™ and 'see through' a screenful of windows to instantly find, activate, tile or close any application. You can customize WideAngle to the way you work. Distribute applications in workspaces according to your own workflow. Create groups of programs to automatically launch. Select applications, like E-mail or utilities, you want to appear in every active workspace. The choices are yours. If you depend on DOS, WideAngle 2.0 makes moving to Windows easy. For more information, call **1-800-736-4198**.

WIDEANGLE™

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**Circle 73 on reader service card**

# Overnight Account Ability.

**Computerize your books in record time with One-Write Plus, the small business accounting system you already know how to use.**

Before you strap yourself with accounting software that's a chore to learn and even harder to use, take a look at One-Write Plus—the full featured, affordable accounting system you can run in a matter of hours.

In fact, if you can write a check, you can use One-Write Plus. That's because it's based on the one-write manual system you're probably using right now. With One-Write Plus, you'll be billing customers faster, collecting receivables sooner, balancing budgets better and producing more meaningful financial reports. Which helps keep your business in the black, and you out from under your books.

### Full-tilt, fully integrated accounting software.

Not only is One-Write Plus easy to install and use, it's easily the most complete accounting program in its price range.

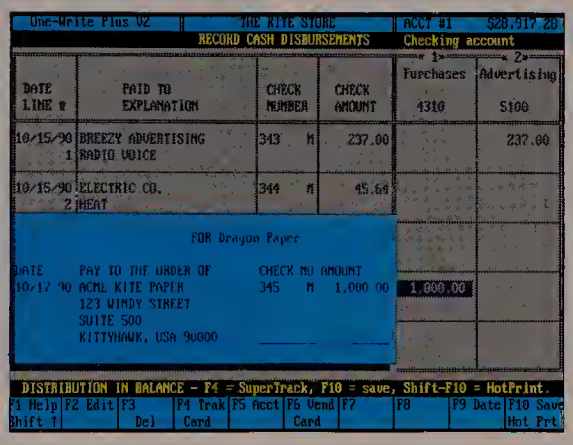
$299.00

Everything you need for fast, easy accounting is right in the box: General Ledger with Checks and Receipts, Accounts Receivable with Invoicing, and Accounts Payable. And they're all connected, so every time you write a check, send an invoice, or receive a payment, all other parts of the program are updated automatically.

You can keep records on up to 5,000 customers and vendors right at your fingertips. Using simple menus and screens, you can quickly compare vendor prices. Reveal purchasing patterns. And take advantage of vendor discounts. So you can hold onto more of your money, longer.

One-Write Plus even lets you create and override payment schedules, so you can pay who you want, when you want. Something most other accounting programs won't let you do.

In fact, you could pay hundreds more for accounting software and not get as many features, or this kind of performance. Good reasons why accountants count on One-Write Plus. And recommend it for small businesses like yours.




*One-Write Plus looks and works just like the manual one-write system you're probably using now. Only faster, easier, and far more accurate.*

### Control job costs and inventory, and maximize your income with SuperTrack™.

No matter what business you're in, One-Write Plus can help you manage it better, with SuperTrack. It's the ultimate, customizable tracking feature that shows you precisely where your money's coming from. And where it's going.

With SuperTrack, you can quickly track income, commissions, expenses, inventory, projects and more. By customer. By hour. By employee. Any way you need to. Then produce comprehensive activity reports that let you look at your finances the way it makes the most sense for your business, your industry, your accountant, and your bank.

It's a powerful tool that generates information every business needs. And you won't find it anywhere else.

### Take 30 days and prove it to yourself.

Accounting is time-consuming enough. Why spend even more time with software you have to sweat over? Discover One-Write Plus. It's the proven accounting software you already know how to use. And it's guaranteed. If you're not managing your finances more effectively in 30 days, we'll send your money back. We'll even provide 30 days of free hotline support to ensure your success.

PC WORLD BEST BUY
PC World, February 1990

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Place your order by 3:00 pm (Eastern Time), and you can have One-Write Plus the next day. So you can spend more time making money and less time accounting for it. Starting tomorrow.

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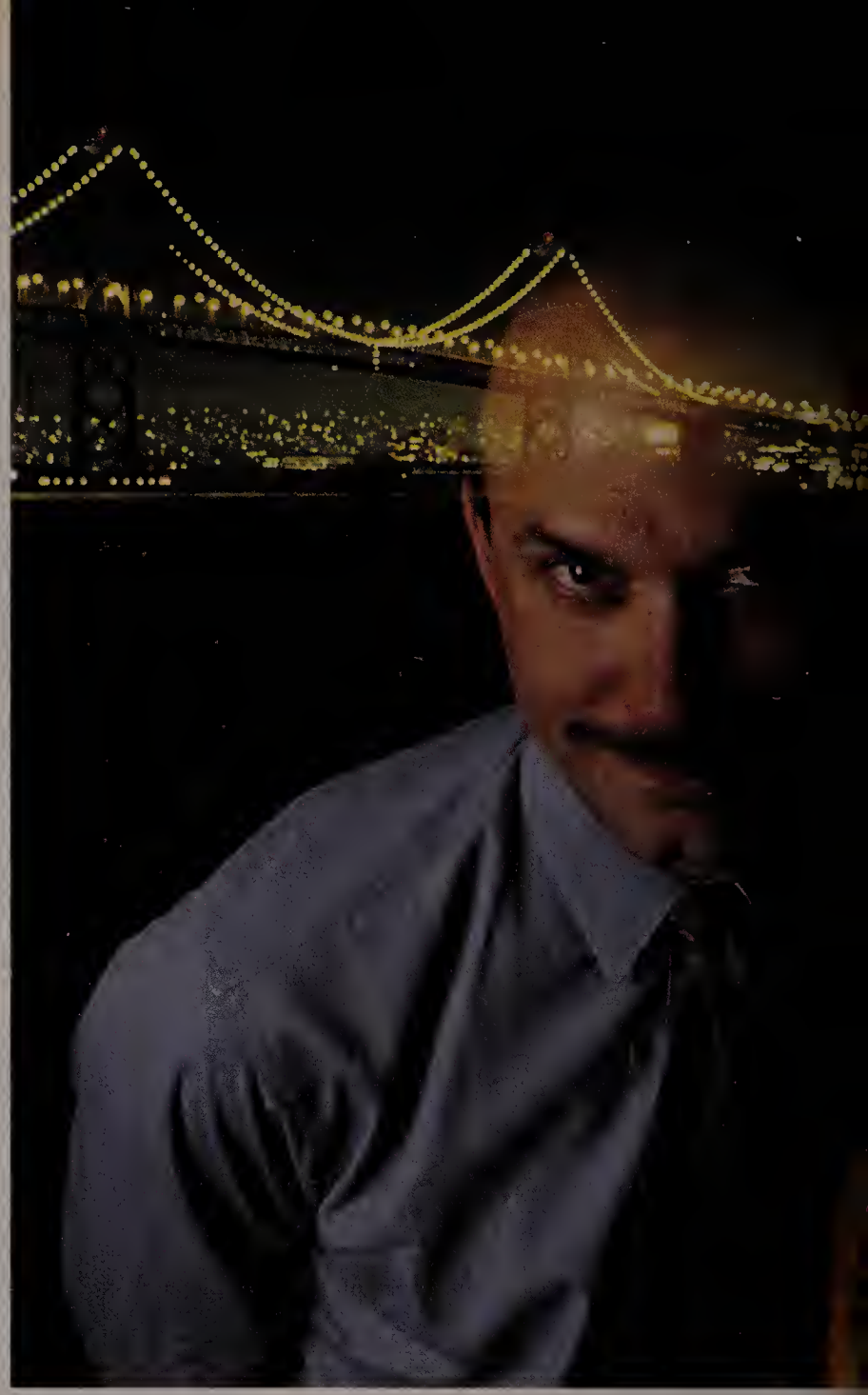
Circle 110 on reader service card

# BUDGET TO WIN

When you want the top brass to approve a major purchase, you need a shrewd strategy. Here are six smart steps managers used to get the new hardware they were after.



JAMIE TANAKA

If your company is like most, it probably started small and built slowly, adding PCs on an ad hoc basis. While the company grows, its PC technology ages. One day, you realize you have to convince senior management—who often don't use computers—to sign off on an expensive system upgrade. You'd sooner face a firing squad.

This was the situation confronting Ken Johnson, a senior project engineer at Geomatrix. Since the Loma Prieta earthquake in 1989, Geomatrix, a San Francisco–based firm that provides earthquake, foundation, and environmental engineering consultation for such clients as the Port of Oakland, has grown 40 percent, and it shows no sign of slowing down. Johnson states the company's quandary simply: "We're terribly busy. People need to work more efficiently, and our standalone, low-end PCs weren't cutting it. We needed a more powerful and efficient system than our 'sneaker net' for analyzing and sharing data."

The obvious answer to the company's problems was a local area network. But how could the employees convince the CEO, who doesn't like computers, to ask the board of directors to shell out $100,000 for the network server, wiring, and software necessary to link 100 users? "The network is by far the largest and most expensive system we ever asked for," says Johnson. Because of the expense, Johnson and his team had to put together a solid strategy for selling the CEO.

SUSAN LUSTY

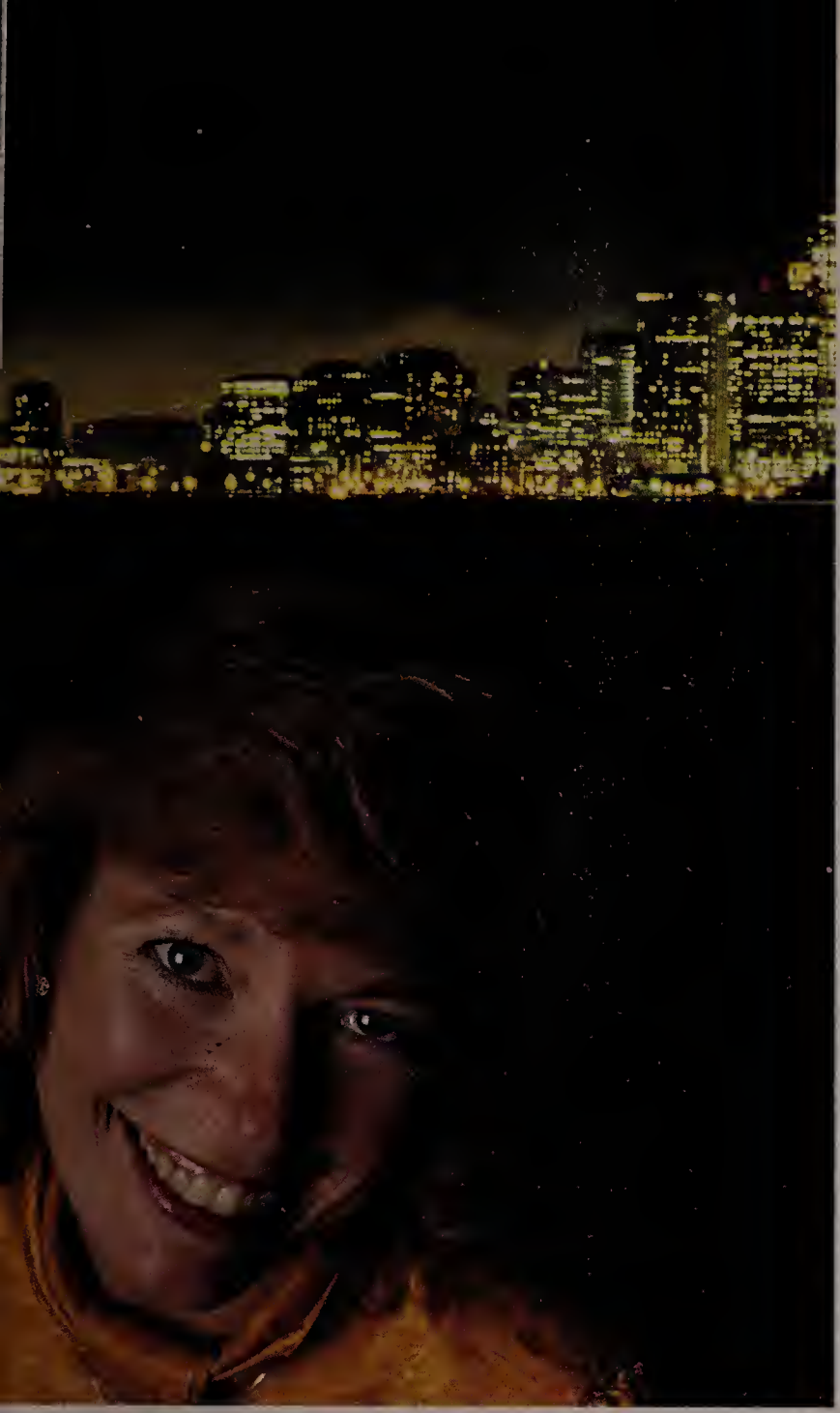
## STEP ONE: THE CFO FACTOR

No individual Geomatrix manager had the expertise or the inclination to convince upper management of the need for such a complex new system. Instead, the managers and staff formed a computer committee made up of a representative from each of the three engineering groups and Jim Price, the company's chief financial officer. Including the CFO in the committee was a shrewd move. "Jim represents main management's ear, and he makes sure we answer questions about cost," says Johnson. "Because he was part of the committee's discussions from the beginning, Jim was ultimately able to make the harsh reality of spending a hundred thousand dollars more palatable to the CEO and the board."

## STEP TWO: ENLISTING THE TROOPS

Next, the committee set about gathering evidence and enlisting the grass roots support of other employees.

The computer committee began to gather examples of productivity blocks in areas such as analysis, data sharing, and printing, compiling evidence that engineers' computers were inadequate. "We are mainly an IBM 286 clone office," explains



*Ken Johnson and Christine Patton of Geomatrix helped convince their company's CEO and board of directors to go for a LAN.*

## THE BOTTOM LINE

**PROBLEM:**

- Inefficient data transfer, analysis, and printing
- Management reluctant to finance unfamiliar technology

**SOLUTION:**

- Employees formed computer committee
- Enlisted key upper management players
- Did careful research and cost justification

**BENEFITS:**

- Improved productivity
- $4000 a month in consultant fees and billable hours recouped
- Less duplication of work through shared files

Johnson. With only two printers and four 386 machines to handle larger analytical jobs, engineers had to do their number crunching early in the morning and on weekends.

A first attempt at dealing with the printing bottleneck involved a printer sharer connected to the PCs through the company's PBX phone lines. This method worked poorly, and staff complained of wasting time trying to print documents and transfer files to each other. "We had to copy our files onto a floppy and walk them over to co-workers on different floors," says Johnson. "Simple file transfers could turn into an extra hour of work. And we were losing hours of valuable time waiting in line for files to print."

### STEP THREE: NEXT TIME, A SMARTER RFP

When the committee set out to locate a vendor that could install a network, they had to learn by doing. "Our original RFP wasn't much more than a wish list for a network server to support a 100-node network, including software, installation, and support," says Johnson. We were surprised when estimates came back somewhere in the $150,000 range."

Although several vendors responded to Geomatrix's initial RFP, they still had to work with the committee to pin down the company's exact needs. As a result of this experience, says Johnson, the committee learned that a well-researched, detailed RFP—including a background of the company's systems and processes and a detailed description of its technical, product, and service needs—would have saved time working out the fine print with vendors.

### STEP FOUR: MARSHALING TECHNICAL SAVVY

The company had been looking for a technical support person to shepherd its diverse flock of hardware and software. When the company hired a systems administrator, Christine Patton, the committee requested her help with the details of their LAN proposal. After reviewing the RFP responses, Patton recommended that the committee ask to install a Novell 3.11 ethernet 10Base-T network to support 85 nodes, using a 33-MHz Compaq Deskpro 486 as a dedicated server. The Deskpro, she noted, should be loaded with a 650MB hard drive and 12MB of RAM.

Patton interviewed the network system vendors, refined and standardized the responses, and negotiated the contenders down to $100,000. She helped the committee winnow nominees down to a final candidate and interviewed its references. Geomatrix's bank was a satisfied customer of the vendor, a fact that helped confirm the committee's choice.

Patton also visited the vendor's office and spoke with technicians, asking them tough technical questions and inquiring

about any failures they'd had. By doing so, she gained insight into the types of problems that could occur with the system and the technical support Geomatrix could expect.

## STEP FIVE: JUSTIFYING THE COSTS

The committee got ready to make their case to the CEO, Mahmut Otus, after they knew exactly how much money they would be asking for. They prepared their arguments and compiled a list of existing problems and solutions, complete with dollar amounts.

Billing was a major factor. Because computing had been done on a stand-alone basis, and logging computer time was a hassle for employees, it was difficult for Geomatrix to track computing time to bill back to clients. A LAN would make it easy to record individual log-in and log-out times automatically, thereby helping the accounting department bill computer time more reliably. The committee estimated that billings would increase by $2000 per month.

They also argued that with 100 employees and a $100,000 network, the company would recoup the cost of the network if each employee demonstrated just two days' increased productivity in a year.

The committee's ace in the hole was timing. Geomatrix would soon be moving into a new building so it would be much easier, cheaper, and less disruptive to install the wiring there before they moved in. "Time was on our side," explains Johnson. "The discussions with the CEO and the board went quickly because the decision had to be made quickly."

## STEP SIX: YOU'VE GOT A FRIEND

Prior to the formal presentation to the CEO, several committee members casually discussed the proposal's progress with him around the water cooler and at the company picnic. By the time the committee sent Patton to make their case to him, Otus was eager to listen.

In these discussions, Otus voiced some concerns about service and support details in the vendor's contract draft: The payment terms, service responsibilities, and delivery plans were not clearly spelled out. Patton clarified these issues with the vendor to Otus's satisfaction. With the vendor contract firmed up, the CEO was ready to present the proposal to the board.

"Once Mahmut warmed up to the idea, he supported his staff," says Johnson. Distributing Patton's concise, easy-to-understand summary of the proposal, Otus was able to convey the benefits of the LAN and use the financial justifications established with the CFO. The green light went on, the board approved the purchase of the LAN, and the contract was signed.

## THE END OF THE ROAD

The bottom line for any company in need of an upgrade is that the need does not go away by itself. "If you have a known problem, it will keep rearing its ugly head until it's fixed," says Patton. "But the way you make your case to the people who have to approve the purchase is critical."

If they had to do it all over again, says Johnson, the committee would have prepared the RFP better and hired Patton earlier. Other than that, the committee's strategy worked. Johnson notes that the request for the LAN was filled because the committee supported clear communication with thorough research and careful timing.

With the new LAN in place, employees are more productive. "In just two weeks, the benefits of the network were apparent," says Johnson. "Now we spend less time staring at each other waiting for the printer."

*Susan Lusty is an assistant editor for* PC World.

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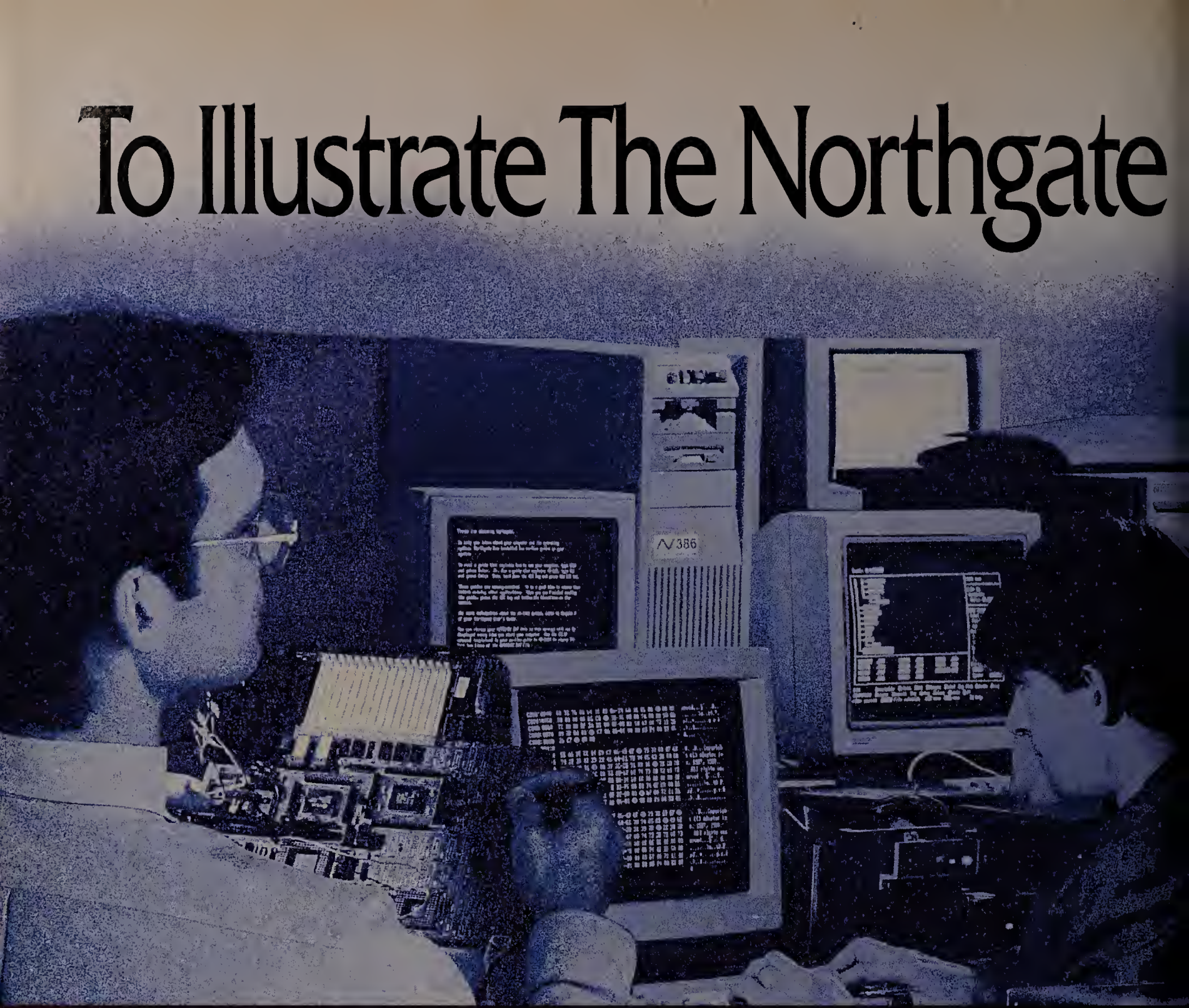
# To Illustrate The Northgate

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KRISTIN KUETER

*Kristin Kueter is an assistant in the president's office at* PC World.

**Understanding proper ergonomics is as easy as listening to your body. Here are some typical ergonomic ailments that plague the modern office worker, and what you can do to cure them.**

**Symptom:** Poin in the wrists, possibly the onset of corpol tunnel syndrome or wrist tendonitis.

**Cure:** Check the height ond ongle of your keyboord, ond invest in o wrist pod. Try lightening your touch on the keyboord—mony users troined on typewriters pound the keyboord unnecessorily.

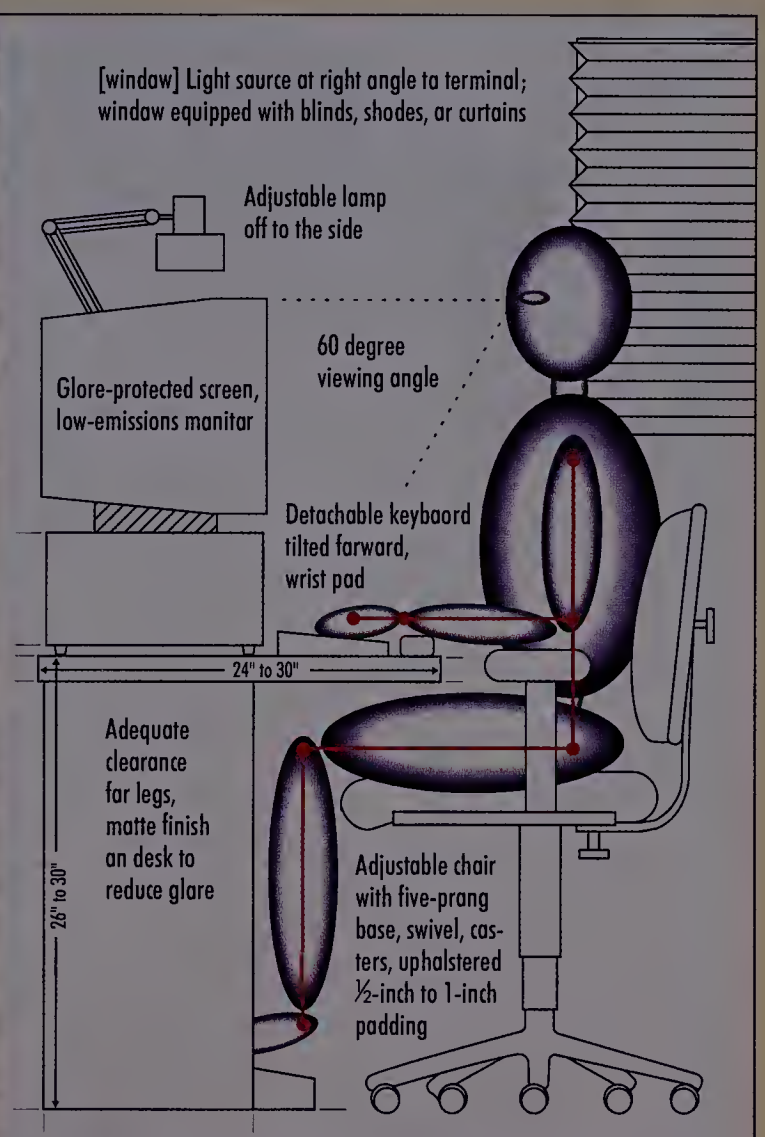
**Symptom:** Sore bock.

**Cure:** Adjust the position of your choir or tilt ond swivel your monitor. Moke sure your chair hos good lumbor support.

**Symptom:** Eyestroin.

**Cure:** Adjust the light source or your computer so light shines ot o right ongle to your screen. If you con't adjust the light ongle, buy o gloreproof screen. Toke ot leost o 5-minute breok ofter every hour or two ot the screen.

Another solution is to upgrode to o multiscon monitor ond super-VGA boord with o refresh rote of ot leost 70 Hz, which reduces screen flicker. While you're ot it, consider o low-emissions monitor, designed to minimize possible heolth risks ossocioted with electromognetic radiotion.




For good workstotion ergonomics, you need the proper viewing ongle ond distonce, sitting position, desk height, ond leg cleoronce.

Source: The Spoce Management and Design Group, o San Francisco orchitecturol/interior design firm thot counsels on erganamics and legal compliance.

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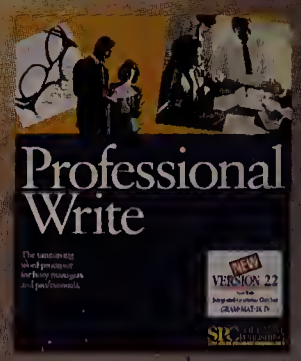


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# STAR-DOT-STAR *.*

A global exchange of personal computer discoveries

*Edited by Brett Glass*

### Finding Your Way Back Home

Many batch files change the current directory on one or more of your system's drives. Unfortunately, there's no way for a batch file to know what directory you're in when you run it, and therefore no way for it to return to its directory of origin.

That is, until now. I've written a short assembly language program, BACK.COM, that lets batch files do just that. The program saves the current directory's path in a directory-changing batch file. By putting this command at the beginning of a batch file and—via the CALL command—running the batch file it creates at the end, you'll ensure that your batch file will always start and end in the same directory, regardless of where it goes in between.

*Charles N. Jackson III*
*Silver Spring, Maryland*

*Editor's note: I rewrote BACK.COM to make it smaller and more bulletproof, then added it to some of my batch files, where it worked wonderfully. At that point, I realized I wanted a second, similar utility; one that would return me to the drive I was logged on to before the batch file ran. I created another program, BACKD.COM, which generates a batch file to accomplish this. As with BACK.COM, you put BACKD.COM at the beginning of your batch file and the file it creates at the end.*

*The DEBUG script in* **LISTING 1** *creates both programs in one easy step. Copy the listing to a text file called BACK.DAT, then double-check the code for any errors; I recommend checking by reading* down *the columns rather than across. Note that the file has no occurrences of the uppercase letter* O; *any character that looks like an* O *is a zero. At the DOS prompt, type* **DEBUG < BACK.DAT**. *Two program files—BACK.COM and BACKD.COM—will appear in the current directory. Move both to a directory listed in your path command.*

**LISTING 2** *shows how to use both BACK.COM and BACKD.COM. Note that you can use BACK.COM several times to restore the original directory on any number of drives. On the other hand, you need to use BACKD.COM only once—to restore the original drive before the batch ends.*

```
N back.com
E100 B4 19 CD 21 00 06 20 01
E108 FE C0 8A D0 BE 23 01 B4
E110 47 CD 21 72 07 B4 09 BA
E118 1D 01 CD 21 C3 43 44 20
E120 41 3A 5C
F123 162 20
E163 0D 0A 24
RCX
0066
W
N backd.com
E100 B4 19 CD 21 00 06 10 01
E108 B4 09 BA 10 01 CD 21 C3
E110 41 3A 0D 0A 24
RCX
0015
W
Q
```

**LISTING 1: Run this script through DEBUG to produce BACK.COM and BACKD.COM, two programs that let you restore original directories and the original drive.**

```
@ECHO OFF
REM Save the current drive
BACKD > D:\DRIVE.BAT
REM Save current directories of drives
REM C: and D:
C:
BACK > D:\CBACK.BAT
D:
BACK > D:\DBACK.BAT
REM Do something (like run a program) that
REM will change your drive and directory
CD \DOS
D:
CD \
REM Restore everything
CALL D:\CBACK.BAT
CALL D:\DBACK.BAT
CALL D:\DRIVE.BAT
REM Clean up
DEL D:\CBACK.BAT > NUL
DEL D:\DBACK.BAT > NUL
DEL D:\DRIVE.BAT > NUL
ECHO ON
```

**LISTING 2: Run BACKTEXT.BAT, or a batch file like it, to see how BACK.COM and BACKD.COM return you to your original drive and directory.**

### Retrieving Your Precious Prompt

Many programs have commands that allow you to "shell out" to DOS and then return to your work by typing EXIT. The problem we encountered was that users were forgetting to type EXIT and loading the program again, thus running out of memory.

Some programs, such as *WordPerfect 5.1*, change the DOS prompt to remind you to type EXIT; others, like *1-2-3*,

ANTHONY RUSSO

don't. If your program's in the latter group, here's a simple way to add the right instructions. This sample batch file [see **LISTING 3**] changes your prompt, loads *1-2-3*, then restores your original prompt after you exit the spreadsheet. If you invoke DOS from within *1-2-3*, you'll see a two-line prompt:

[Enter EXIT to return to 1-2-3]
C:\123>

The batch can be modified to load almost any program.

Since the new prompt is stored in the environment and may be bigger than your original one, make sure you have enough space to hold it. You may have to add the line **SHELL=C:\COMMAND.COM /E:** *XXXX* **/P** to your CONFIG.SYS file, where *XXXX* is the amount of environment space you want. A setting of 1024 should be more than sufficient.

*Douglas J. Nakakihara*
*Simi Valley, California*

### Am I Weally in Windows?

I frequently want my batch files to know whether a DOS program is running from within a *Windows* DOS virtual machine or from the DOS prompt alone. According to Microsoft, it's dangerous to run certain programs, such as CHKDSK, while you're in *Windows*. I also need to write batch files that display a message telling the user how to switch back to *Windows* with a hot key.

I discovered that when *Windows* is running, it creates an environment variable with the name 'windir' that points to the *Windows* directory. Normally, one can test for variables with the '==' operator, but '==' assumes that variable names are all uppercase, and 'windir' is lowercase. (Microsoft probably did this so the SET command couldn't create or change the variable.) Any reference to 'windir' in a batch file actually looks for a variable named 'WINDIR,' which isn't the same thing.

To circumvent this problem, I wrote a small assembly language program [see **LISTING 4**] that searches for 'windir.' If it's found, the program returns an ERRORLEVEL of 1; otherwise it returns an ERRORLEVEL of 0. I called the program InWinEQ1, which is a mnemonic for "In *Windows* Equals 1." CHKDSK.BAT [see **LISTING 5**] shows how you can use InWinEQ1 to prevent users from running CHKDSK from within *Windows*. First, put CHKDSK.BAT and INWINEQ1.COM in a directory listed in your PATH command and rename your DOS directory's CHKDSK.COM to **CHKDSK!.COM** (depending on your DOS version, CHKDSK may be an EXE program). When a user types CHKDSK, the batch file will check to see if *Windows* is running. If it is, InWinEQ1 will return an ERRORLEVEL of 1, and the batch file will go directly to the :INWINDOWS line, skipping the CHKDSK! command. You can easily modify this batch file for other purposes.

*Christopher J. Stein*
*Durham, North Carolina*

```
@ECHO OFF
ECHO Loading 1-2-3....
SET | FIND "PROMPT=" > C:\OLDPROMP.BAT
PROMPT [Enter EXIT to return to 1-2-3]$—
$P$G
123
CALL C:\OLDPROMP
DEL C:\OLDPROMP.BAT
```

**LISTING 3: This sample batch file shows how to change your DOS prompt temporarily for shelling out of an application.**

```
N InWinEQ1.com
E100 A1 2C 00 8E C0 BF 00 00 26 8A 05 3C 00
74 25 BE
E110 3D 01 8A 1C 80 FB 00 74 16 26 8A 05 3A
C3 75 04
E120 47 46 EB EE 47 26 8A 05 0A C0 75 F8 47
EB D9 C6
E130 06 3C 01 01 B4 4C A0 3C 01 CD 21 00 00
77 69 6E
E140 64 69 72 3D 00
RCX
45
W
Q
```

**LISTING 4: Run this script through DEBUG to get InWinEQ1, a Windows-testing program.**

*Editor's note: The* Windows *documentation says that running CHKDSK, SUBST, JOIN, FASTOPEN, or ASSIGN in a* Windows *DOS virtual machine can cause major problems, but Microsoft does nothing to prevent this from happening. Mr. Stein's technique makes sure you don't lock up your machine—or worse, corrupt your disk.*

*To create the program, type the code in* **LISTING 5** *into an ASCII text file called INWINEQ1.DAT. Double-check the code for any errors; again, I recommend checking by reading* down *the columns rather than across. And again, there are no occurrences of the uppercase letter* O *in this file; if you see something that looks like one, it's a zero. Next, at the DOS prompt, type* **DEBUG < INWINEQ1.DAT**. *Move the resulting program file, INWINEQ1.COM, to a directory listed in your PATH command for easy access.*

*Launching what I hope will become an annual tradition, April's* Star-Dot-Star *will include a few "fun" tips: humorous utilities, harmless pranks, and programs that create unusual sounds and graphics (nothing destructive, please!). As always,* Star-Dot-Star *pays $25 to $200 per tip used. If you have a tip you think will tickle readers' funny bones (or that someone might find useful), send it to* Star-Dot-Star, PC World, *501 Second St. #600, San Francisco, CA 94107; CompuServe 74055,412; MCI*

```
@ECHO OFF
InWinEQ1
IF ERRORLEVEL 1 GOTO INWINDOWS
CHKDSK! %1 %2 %3
GOTO DONE
:INWINDOWS
ECHO You cannot run CHKDSK
ECHO from inside Windows!
:DONE
ECHO ON
```

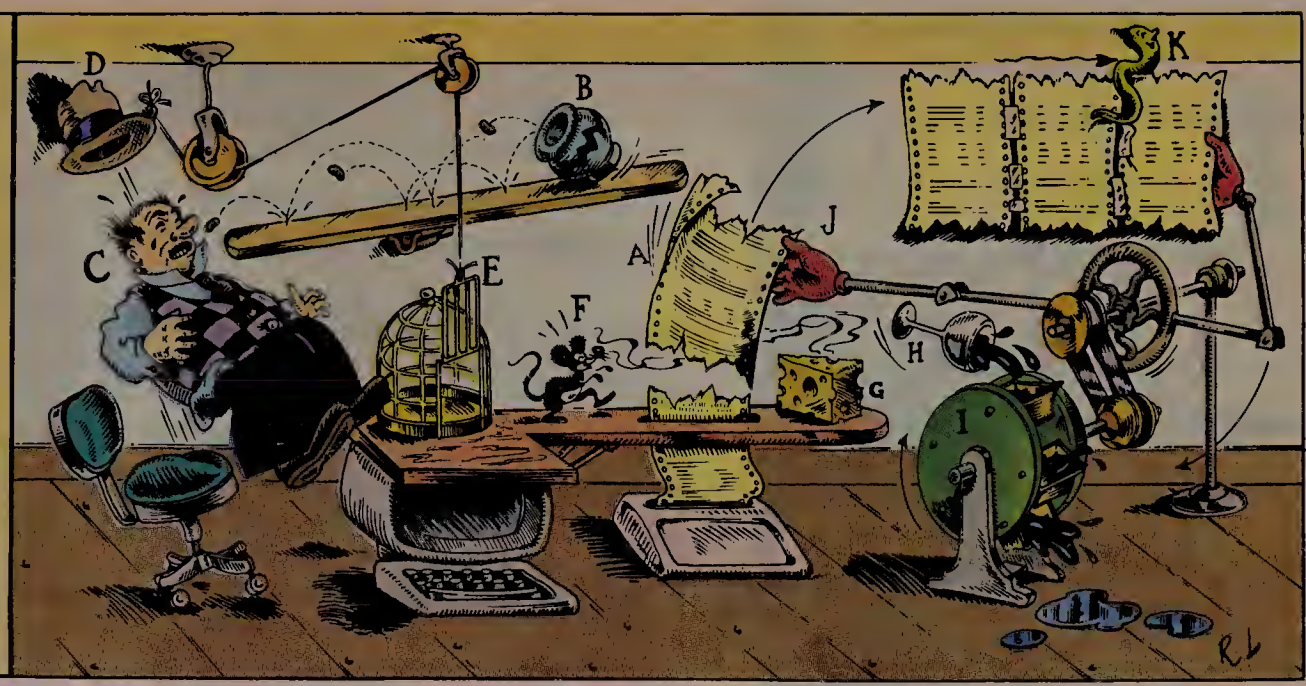
**LISTING 5: This sample batch file uses InWinEQ1 to make sure that users don't run CHKDSK from within Windows.**

RISING SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBOBULATED THAT HIS HAIR STANDS ON END, DISLODGING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (K).

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*Brett Glass is a contributing editor for* PC World.

## POWER TIP NO. 229

### Collecting Windows 3.0 Icons

*Windows 3.0*'s Windows Setup utility puts program icons in various group windows and group icons. This makes running applications located in far-flung directories as easy as clicking a mouse button or pressing a few keys. The default groups (Games, Accessories, Non-Windows Apps, and so forth) arrange icons by application type. But after you've worked with *Windows 3.0* for a while, you'll want to transfer the applications you use regularly into a single, accessible group. From Program Manager, select *File New Program group OK* to create a new window. Enter a name of your choice as the Description. Then open the default-group windows, and drag the icons you want into the new window. Don't worry if icons overlap. When you're done, select each empty window and press <**Delete**> to remove it. Adjust the new window's size to fit your needs, and arrange the icons alphabetically to make individual programs easy to find. Finally, select *Window Arrange icons* from the Program Manager menu to put the icons into neat rows.

*Brian Livingston*
*New York*

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# BASICS: HARVARD GRAPHICS

**What to do:** You select a menu option by typing the number or letter to its right (shown here in bold), using the cursor keys to highlight an option and pressing **<Enter>**, or moving the mouse pointer to an option and clicking the left mouse button. To complete most tasks, you need to press **<F10>**.

## GETTING STARTED

| | |
|---|---|
| Open Main Menu | **<F6>** |
| Cancel task and close menu | **<Esc>** or click the right mouse button |
| Get context-sensitive help | **<F1>** |
| Display Help Index menu | **<Shift>-<F1>** |
| Display "Speed Keys" list | **<Ctrl>-<F1>** |

## CREATING AND MODIFYING A CHART

| | |
|---|---|
| Start new chart | **<F6>**, Create chart **1**, select chart type |
| Save chart | **<Ctrl>-S** (**<F6>**, File **4**, Save chart **4**), type directory and file name |
| Create chart from gallery | **<F6>**, Create chart **1**, From gallery **6**, select chart type, select options |
| Display chart | **<F2>** |
| Enter or edit titles and footnotes | **<Ctrl>-T** (**<F8>**, Titles/Footnotes **1**), select item, type or change |
| Add note to title chart | **<Ctrl>-N** (**<F8>**, Notes **3**), type note |
| Add note to any other chart | **<Ctrl>-N** (**<F8>**, Notes **4**), type note |

Fold Here

| | |
|---|---|
| Select text | **<F5>**, highlight text with mouse/cursor |
| Select text line | **<Shift>-<F5>** |
| Check spelling | **<F7>**, Spell check chart **1**, select option if word not found in dictionary |
| Add a special character | Move to location, **<Ctrl>-B** (**<F7>**, Special character **2**), select character |
| Edit current chart in memory | **<F6>**, Edit chart **2** |
| Get existing chart from disk | **<Ctrl>-G** (**<F6>**, File **4**, Get chart **1**), select or type directory and file name |
| Clear current chart's data | **<F6>**, Create chart **1**, Clear values **7** |
| Clear current chart | **<F6>**, Create chart **1**, Clear chart **8** |
| Change date/time/currency format | **<F7>**, International format **3**, select item, **<F3>**, select format |
| Change text attributes of title chart | **<F8>**, Text attributes **1**, select line, select attribute, **<F3>**, select option |
| Change text attributes of any other chart | **<F8>**, Text attributes **2**, select line, select attribute, **<F3>**, select option |
| Change chart appearance of title chart | **<F8>**, Appearance **2**, select item, **<F3>**, select option |
| Change chart appearance of any other chart | **<F8>**, Appearance **3**, select item, **<F3>**, select option |
| Import data | Create/get chart, **<F6>**, File **4**, Import **7**, select type, select directory, select file name, select graph/range/field name and/or highlight data |
| Export current chart | **<F6>**, File **4**, Export **8**, select type, type directory and file name, select options |
| Print chart | Create/get chart, **<F6>**, Output **5**, select output device, select item, **<F3>**, select options |

### Text Charts

**Note:** You can create text charts in three fixed formats: title charts, bullet charts, or columnar table charts. You can also create free-form text charts with the Draw function. Titles, subtitles, bulleted lines, and footnotes are centered by default and can be up to 100 characters long. In bullet charts, bullets are added automatically to lines under blank lines. Table charts can have up to 24 rows and 24 columns and up to 50 characters per cell, except row 1, which can have two 50-character lines per cell.

| | |
|---|---|
| Create text chart | **<F6>**, Create chart **1**, Text **1**, select format, type text |

### Text Charts (continued)

| | |
|---|---|
| Change character attributes | Select text, **<F10>**, select attribute, **<F3>**, select option |
| Insert blank line | **<Ctrl>-<Insert>** |
| Delete current line | **<Ctrl>-<Delete>** |
| Swap current line above/below | **<Ctrl>-<Up>**/**<Ctrl>-<Down>** |
| Change bullet style | Move to bulleted line, **<F9>**, select item, **<F3>**, select option |
| Change all bullets | **<F8>**, Bullet options **5**, select option |
| Remove bullet | Move to location, **<F9><F3>**, **N**one |

**Tip:** You can use special characters as "secondary-level" bullets, but you have to create (and delete) them individually, and they're not affected by **<F8>5** and **<F9>** bullet commands.

### Pie Charts

**Note:** Pie charts can have up to six pies, each of which can contain up to 24 slices. In charts with only two pies, you can link the second pie to one slice of the first pie. Blank-, negative-, or zero-value slices are ignored. Slice labels can have up to 22 characters. There is only one legend per chart.

| | |
|---|---|
| Create pie chart | **<F6>**, Create chart **1**, Pie **2**, type titles, type label and value for each slice |
| Separate slice | Move to Cut, **Y<Enter>** |
| Change slice's color | Move to Color, **<F3>**, select color |
| Create additional pies | **<Ctrl>-<Page Down>**, type title, type labels and values |

Fo He

| | |
|---|---|
| Move between multiple pies | **<Ctrl>-<Page Up>**/**<Ctrl>-<Page Down>** (**<F9>**, select pie) |
| Set chart options | **<F8>**, Style **5**/Legend **7**, set options |
| Set individual pie options/formats | **<F8>**, Pie options **6**/Slice values **8**/Slice percents **9**, set options |
| Link first and second pies | Move to slice to explode, set Cut to **Y**es, **<F8>**, Style **5**, set Link pies 1&2 to **Y**es |
| Change pie chart to XY chart | Create pie chart and save it, **<F6>**, Create chart **1**, XY **3**, select type, set Keep current data to **Y**es |

### XY Charts

**Note:** XY charts have one *x*-axis series and up to 16 *y*-axis series, which can be displayed as bars, stacked bars, lines, areas, high/low/close indicators, or combinations of these. Each series can have up to 1000 points, but high/low/close charts in area style will display only the first 500 points.

| | |
|---|---|
| Create XY chart | **<F6>**, Create chart **1**, XY **3**, select type of chart, **<F3>**, select X data type, type titles, type *x*-axis and series (*y*-axis) data |
| Change *x*-axis data type | **<F9>**, Set X data type **1**, **<F3>**, select data type |

**Tip:** To automatically generate *x*-axis data, select X data type and enter starting, ending, and increment values.

| | |
|---|---|
| Add or edit *x*-axis data | Move to first line to change, **<F9>**, Quick X entry **2**, enter values |
| Set chart options | **<F8>**, Style **5**/Legend **7**, set options |
| Set individual series options | **<F8>**, Series **6**, set options |
| Set axis frame style and color | **<F8>**, Axis frame **8**, set options |
| Set axis scale options | **<F8>**, Axis options **9**, set options |
| Hide, show, and format labels | **<F8>**, Format **A**, set options |
| Set data table/labels options | **<F8>**, Data table/labels **B**, set options |
| Enter formulas | **<F9>**, Enter formula **3**, type formula |
| Use calculator to enter value | Move to data point, **<F9>**, Use calculator **4**, type calculation |
| Change XY chart to pie chart | Create XY chart and save it, **<F6>**, Create chart **1**, Pie **2**, set Keep current data to **Y**es |

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# ADVANCED: HARVARD GRAPHICS

### Organization Charts

| | |
|---|---|
| Create organization chart | **<F6>**, Create chart **1**, Organization **4**, type titles |
| Move from titles to box | **<Tab>** |
| Move from box to titles | **<Shift>-<Tab>** |
| Move from box to box | Use cursor keys |
| Add text to current box | Move to box, **<Enter>** or **<Ctrl>-Z**, type text |
| Add subordinate box below current box | **<Ctrl>-<Insert>** (**<F9>**, Add subordinate **2**) |
| Add staff position below box | **<F9>**, Add staff position **3** |
| Move box and subordinates/ subordinates only | Move to box, **<F9>**, Move box/group **4**, select group or subordinates only, use cursor keys to reposition |
| Switch box with left/right box | **<Ctrl>-L/<Ctrl>-R** (**<F9>**, Switch left **5**/Switch right **6**) |
| Delete box and all subordinates | Move to box, **<Ctrl>-<Delete>** (**<F9>**, Delete box/group **7**) |
| Undelete the last deletion | **<F9>**, Undelete **8** |
| Change chart top | Move to desired chart top box, **<F9>**, Set top of chart **9** |
| Hide/show subordinates of current box | **<Ctrl>-H/<Ctrl>-U** (**<F9>**, Hide subordinates **A**/Show subordinates **B**) |
| Change box style, color, contents, arrangement | **<F8>**, Box Options **5**, select item, **<F3>**, select option |

### BUILDING AND USING A PRESENTATION

**Note:** A presentation contains up to 175 chart, PCX; PCC, or other presentation files. You cannot include presentation files that already include presentation files.

| | |
|---|---|
| Create presentation | **<F6>**, Presentation **6**, Create presentation **1** |
| Add file(s) below selected file | **<Ctrl>-<Insert>** (**<F7>**, Add file **1**), select or type directory and first file name, **<F5>** to select additional files/ **<Enter>** to finish |
| Add new chart to presentation | Create new chart, **<Ctrl>-S** (**<F6>**, File **4**, Save chart **4**), type directory and file name, set Add to current presentation to **Y**es |
| Add blank chart | **<F7>**, Add blank chart **A** |
| Save presentation | **<F6>**, Presentation **6**, Save Presentation **5**, type directory, type file name, type description |
| Preview part or all of current presentation | Move to first file, **<F2>**, press any key to see next chart/**<Esc>** to stop |
| Get saved presentation | **<F6>**, Presentation **6**, Get Presentation **4**, select or type directory and file name |
| Print presentation/file list | Create/get presentation, **<F6>**, Output **5**, Presentation **5**/Presentation list **6**, select output device, set options |

Fold Here

### USING DRAW

| | |
|---|---|
| Create drawing chart | **<F6>**, Draw **3** (**<F6>**, Create chart **1**, Drawing **5**), add objects (text, line drawings, symbols, and images) |
| Add drawing to chart | Create/get chart data form, **<F4>** (**<F6>**, Draw **3**, add objects) |
| Edit data chart from Draw | **<F4>**, make changes, save chart |
| Magnify/shrink screen image | Select Zoom tool, select Zoom in/Zoom out icon, click center of area |
| Magnify rectangular area | Select Zoom tool, select Zoom in icon, drag rectangular area |
| Return chart to original size | Select Zoom tool, select Full page icon |
| Display chart at printed size | Select Zoom tool, select Actual size icon, click center of area |
| Scroll magnified chart | Select Zoom tool, select Pan, drag status box rectangle |
| Display rulers | **<F8>**, Rulers **3**, set Show rulers to **Y**es |
| Display grid | **<F8>**, Grid **2**, set Show grid to **Y**es |
| Select grid options, including snap to grid | **<F8>**, Grid **2**, select item, **<F3>**, select option |
| Save Draw settings | **<F8>**, Save Draw settings **6** |
| Add note to drawing | **<Ctrl>-N** (**<F8>**, Notes **7**) |
| Add text | Select text tool, click starting point/drag text box, type text |
| Edit text | Select text, select Edit text tool, select Edit text icon, edit |
| Create an object | Select desired tool, click start point, click intermediate points, click end point |
| Constrain box to square | Hold **<Shift>** while drawing box |
| Undo | **<Ctrl>-U**/click Undo tool |
| Select object | Select pointer tool, click on object |
| Select multiple objects | Drag selection box around objects/hold **<Shift>** and click on objects |
| Select All/None/Similar objects | **<F9>**, Select Objects **3**, **<F3>**, select option |
| Group/ungroup selected object(s) | Select Group/Ungroup tool |
| Modify an object | Select object, select attribute icon, select or type option |
| Change drawing appearance | **<F8>**, Appearance **8** |

| | |
|---|---|
| Remove file | **<Ctrl>-<Delete>** (**<F7>**, Remove file **2**) |
| Duplicate file | **<F7>**, Duplicate file **3** |
| Remove/duplicate consecutive files | Move to first file, **<F5>**, move to last file, **<F5>**, **<Ctrl>-<Delete>** (**<F7>**, Remove file **2**)/**<F7>**, Duplicate file **3** |
| Move file up/down | Move to file, **<Ctrl>-<Up>** (**<F7>**, Move file up **4**)/**<Ctrl>-<Down>** (**<F7>**, Move file down **5**) |
| Move consecutive files up/down | Move to first file, **<F5>**, move to last file, **<F5>**, **<Ctrl>-<Up>** (**<F7>**, Move file up **4**)/**<Ctrl>-<Down>** (**<F7>**, Move file down **5**) |
| Jump to a file | **<Ctrl>-J** (**<F7>**, Jump to file **6**), type number |
| Edit chart from presentation list | Move to chart, **<Ctrl>-E** (**<F7>**, Edit chart data **6**), edit and save, **<Ctrl>-E** |
| Display any saved presentation on screen | **<F6>**, Presentation **6**, Display Screen Show **3**, select or type directory and file name, press any key to see next chart/ **<Esc>** to finish |
| Add transition effects | **<F4>**, move to chart, **<F3>**, select Draw effect, use **<Tab>** and **<F3>** to set other Draw parameters (direction, speed, and time) and Erase parameters (effect, direction, and speed) |
| Set default transition effects | Add transition parameters on line above list of files on Effects view of Edit Presentation screen |
| Assign key/button to a file | Move to chart, **<F9>**, Edit keys **1**/Edit buttons **2**, type name of key/select button, **<Tab>**, type the file number or action (Next, Prev, Last View, First, Last, Notes, Chart, Template, Nextpal, Prevpal, Exit) to be assigned |
| Set default key(s) | Move to line above list of files on Effects view of Edit Presentation screen, **<F9>**, Edit keys **1**, type key(s) and default(s) |

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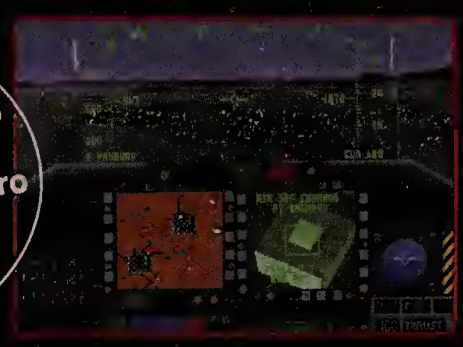

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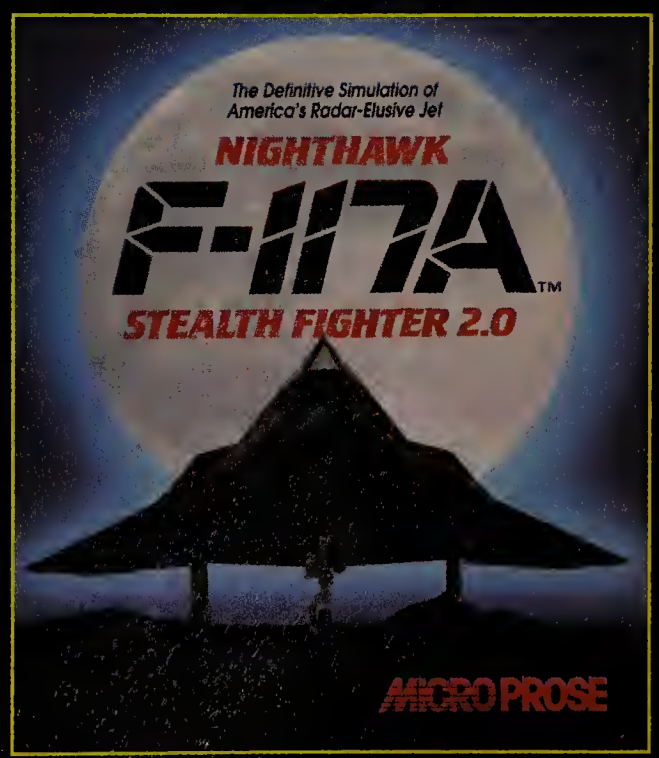


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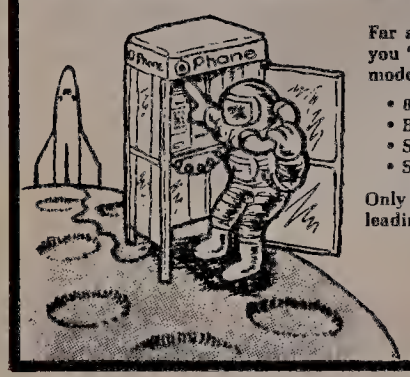


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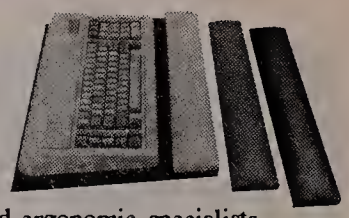

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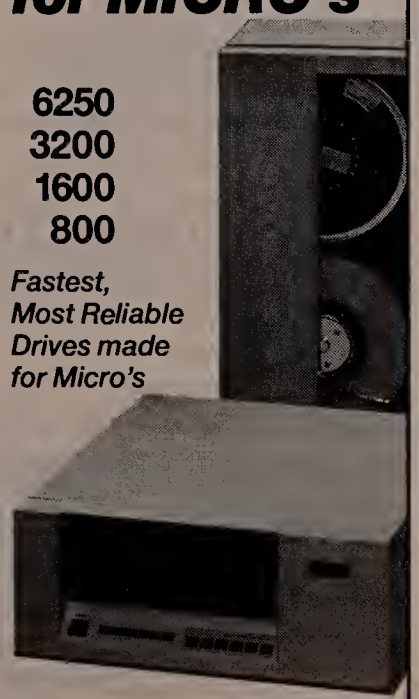

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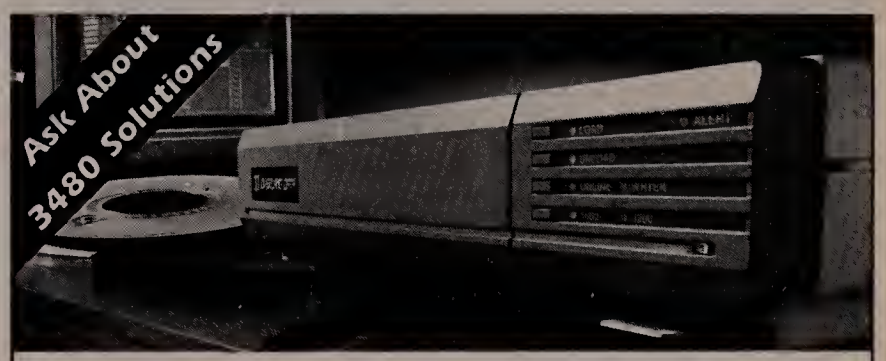


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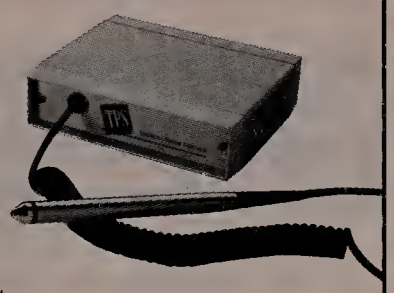

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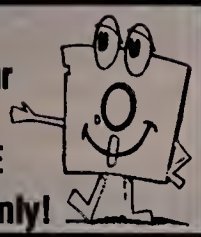

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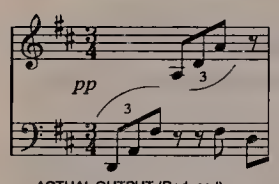


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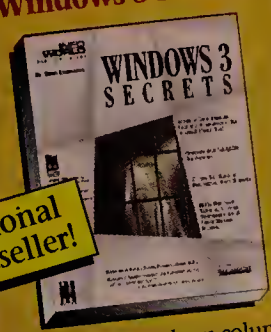


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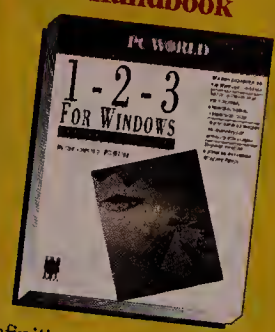


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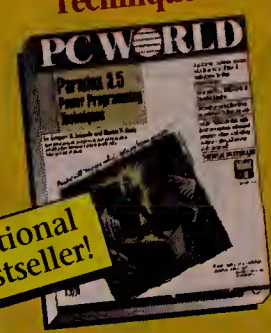


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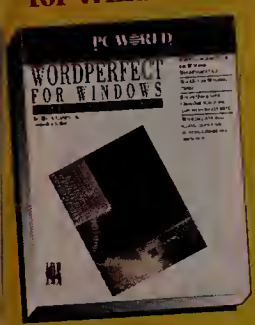


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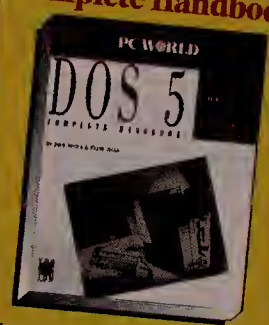


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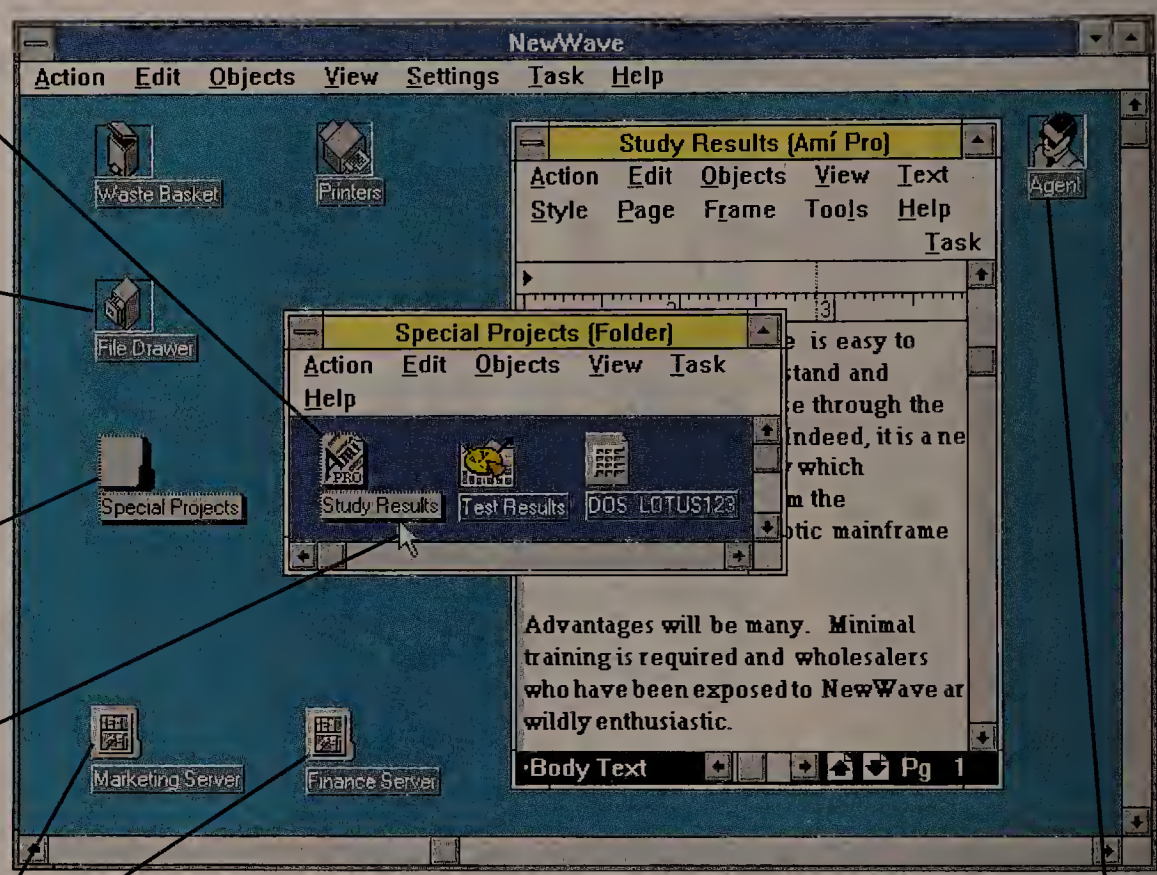


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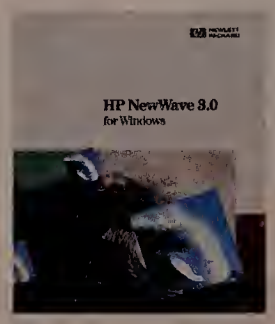


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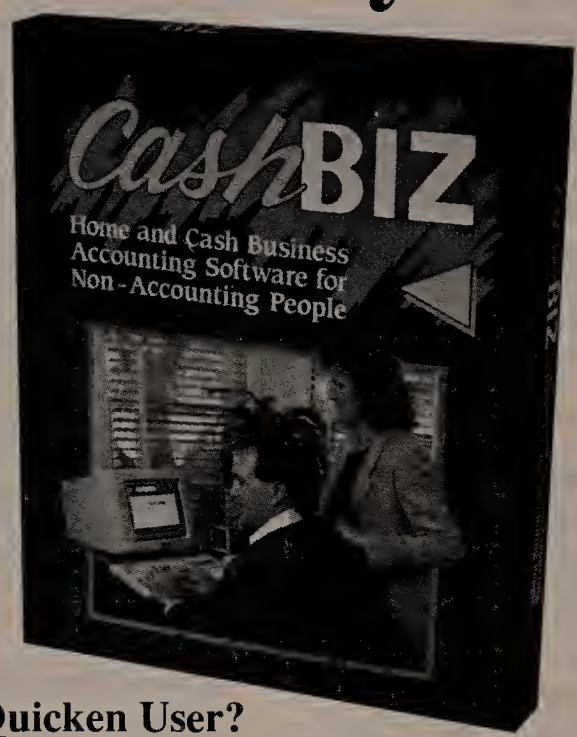


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# FastData Power PCs

## $2599 FastData 486/33

*If you need the ultimate in 486 power, the FastData 486/33 delivers. A true Intel™ 486-33 processor with integrated coprocessor and 8K internal cache is complemented by a 128K external static RAM cache with burst mode support to deliver 14.7 MIPS of processing power. The system is expandable to 16 megabytes of memory on-board using 1mb SIMMS, thus protecting your investment in existing memory when you're ready to upgrade. The FastMicro team has bundled the 486/33 with four megabytes of memory, a high-speed 200mb IDE hard disk and a 1mb Super VGA adaptor and Non-Interlaced monitor at an attractive price. From networking to publishing to CAD, we have what it takes to make your computer a complete solution.*

### Standard Features

- ✓ 33mhz Intel 80486 processor wtih coprocessor.
- ✓ 8K processor & 128K external static RAM cache.
- ✓ 4 megabytes of fast RAM.
- ✓ 200 mb 18ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Full size or upright (shown) chassis with keylock, speed and reset buttons.
- ✓ 14" SVGA Non-Interlaced color monitor, 1024x768 resolution, with 1mb VGA card.
- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 230 watt power supply
- ✓ 8 ISA slots, 5 drive bays.
- ✓ Windows & Mouse add $69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class A approved for business use only.

| 486/33 | 80mb | 100mb | 200mb | 340mb |
|---|---|---|---|---|
| Mono | $1,929 | $1,999 | $2,249 | $2,649 |
| Mono VGA | $2,029 | $2,099 | $2,349 | $2,749 |
| VGA 1024i | $2,229 | $2,299 | $2,549 | $2,949 |
| VGA 1024ni | $2,279 | $2,349 | $2,599 | $2,999 |

## FastData 386/33 $1799

*The fastest 386 processor available combined with a 64K thirty nanosecond memory cache make the FastData 386/33 a power users dream! Included in the base price is a 80 megabyte 20 millisecond hard disk, 1024 by 768 Non-Interlaced Super VGA monitor and card, four megabytes of memory, and 5.25" & 3.5" high capacity floppy drives. Plus, should anything ever go wrong with your FastData computer, you are covered by a one-year warrantee with free on-site service or system replacement if we cannot correct the problem with our FastSHIP advance parts replacement program.*

### Standard Features

- ✓ 33mhz Intel 386-DX processor.
- ✓ 64K high-speed memory cache.
- ✓ 4 megabytes high speed RAM.
- ✓ 105 mb 17ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) or mini-tower with speed, keylock and reset buttons.
- ✓ 387-DX coprocessor socket.
- ✓ 200 watt power supply.
- ✓ 14" SVGA Non-Interlaced color monitor, 1024x768 resolution, with 1mb VGA card.
- ✓ Clock calendar, parallel port, game port and two serial ports.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 slots & 5 drive bays.
- ✓ Built-in memory management.
- ✓ MS-DOS 5.0.
- ✓ Windows & Logitech Mouse add $69.
- ✓ FCC Class B approved.

| 386/DX33 | 80mb | 100mb | 200mb | 340mb |
|---|---|---|---|---|
| Mono | $1,379 | $1,449 | $1,699 | $2,099 |
| Mono VGA | $1,479 | $1,549 | $1,799 | $2,199 |
| VGA 1024i | $1,679 | $1,749 | $1,999 | $2,399 |
| VGA 1024ni | $1,729 | $1,799 | $2,049 | $2,449 |

intel inside

## FastData NoteBook

*New 80mb SX/20 model!*
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- **On-Site Service or System Replacement Should Unusual Problems Arise**
- **30 Day Money Back Guarantee**
- **FastMicro Peace of Mind**

# FastData SX Systems

## $1399 FastData SX/20

*25% faster than a 16mhz SX, the FastData SX/20 adds even greater performance to its 386 multitasking capabilities. Just $200 more than our SX/16, this machine also includes an 80mb hard drive in addition to the super VGA color monitor and 16 bit VGA adaptor, Keytronics keyboard, DOS 4.01 or 5.0, and two floppy drives. The system includes two megabytes of memory and is expandable to eight on the main system board. Remember, when you have questions, need to solve a problem, or want recommendations on products for your system, the FastMicro team is standing by toll-free to provide product support for as long as you own your FastData personal computer.*

### Standard Features

- ✓ 20mhz Intel™ 386-SX processor.
- ✓ 2 megabytes of high speed RAM.
- ✓ 80 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) or mini-tower with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add $69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class B approved.

| 386/SX20 | 40mb | 80mb | 100mb | 200mb |
|---|---|---|---|---|
| Mono | $969 | $1,099 | $1,169 | $1,419 |
| Mono VGA | $1,069 | $1,199 | $1,269 | $1,519 |
| VGA Color | $1,219 | $1,349 | $1,419 | $1,669 |
| VGA 1024i | $1,269 | $1,399 | $1,469 | $1,719 |

## $1249 FastData 386/SX

*Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and also want to run their favorite DOS applications at surprising speeds. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit super VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.*

### Standard Features

- ✓ 16mhz Intel™ 386-SX processor.
- ✓ 2 megabytes of fast RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard , mini tower, or mini desktop (shown) chassis with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add $69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class B approved.

| 386/SX16 | 40mb | 80mb | 100mb | 200mb |
|---|---|---|---|---|
| Mono | $949 | $1,079 | $1,149 | $1,399 |
| Mono VGA | $1,049 | $1,179 | $1,249 | $1,499 |
| VGA Color | $1,199 | $1,329 | $1,399 | $1,649 |
| VGA 1024i | $1,249 | $1,379 | $1,449 | $1,699 |

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## DISK DRIVES

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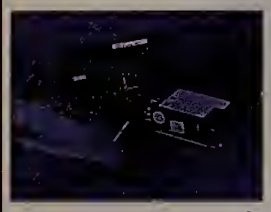
- Hitachi Ext. 680mb Kit.....499
- Sony Int. 680mb Kit.....379
- Book of Mammels / Enclopedia.....49/69
- MS Bookshelf, Stat. Pack, World Atlas & Consultant CDs.....99

**Colorado**
- DJ-10 40-120mb Int. Tape.....239
- DJ-20 80-240mb Int. Tape.....299
- External Kit.....69

### Toshiba 100mb IDE Kit $369



Upgrade your 286 or 386 to IDE technology and Toshiba quality at a FastMicro price. This kit comes with a fast 20ms 105mb drive and built-in 1:1 controller, 16 bit IDE card with dual floppy controller & cables, 5.25" brackets & rails.

**Conner** (see FastData IDE controllers)
- CP3044 40mb IDE 28ms.....199
- CP3104 100mb IDE 25ms.....349
- CP3208 200mb IDE 25ms.....599

**DTC**
- 6280 ESDI 16bit HD/FD Cont.....119
- 6280-15T 15mbit/sec transfer rate ....169

**Micropolis** (see DTC Controllers)
- MC1664 345mb HH ESDI 14ms.....1099
- MC1568 668mb FH ESDI 14ms .....1499
- MC1518 1.3gb FH ESDI 14ms.....2595

**Plus Development**
- HardCard IIXL 50mb 9 ms 16bit.....399
- HardCard IIXL 105mb 9 ms 16bit.....579

### Seagate 89mb AT Kit $319

IDE performance, big 89 megabyte capacity, 19ms access time and 5 mbps transfer rate make this a great buy. Controller, cables and rails are included to make installation fast and easy.

**Seagate**
- 30MB XT Kit ST238 w/ cont. .....249
- 40MB AT ST251-1 MFM Drive.....229
- 40MB AT ST157A 28ms IDE Drive...179
- 89MB ST3096A 19ms IDE Drive.....299
- 125MB ST1144A 19ms IDE Drive.....359
- 210MB ST1239A 15ms IDE Drive.....599
- 330MB ST2383E 16ms ESDI Drive 1199

**Teac**
- 1.2MB 5.25" Floppy.....65
- 1.44MB 3.5" Floppy.....65

### Toshiba 1.44mb Floppy $59

Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5" disks. Rails, add $5.

**Toshiba**
- 360K 5.25" Floppy (Black) .....59
- 1.2MB 5.25" Floppy .....59
- 1.44MB 3.5" Floppy .....59
- 107mb 1034 IDE 3.5" drive.....349

**Western Digital**
- WD93044 40mb IDE 28ms.....199
- WDAC280 80mb IDE 20ms.....299
- WDAP4200 200mb IDE 20ms.....599

## MODEMS & FAX

**ATI**
- 2400 ETC Internal / External .....129/159
- 8514/Ultra+VGA 1mb .....599
- 9600/E External MNP V.42bis .....369

### ATI 9600ETC•E $369

ATI delivers speed and accuracy with the 9600 Etc•E! It includes V.42, LAP-M, and MNP error correction combined with MNP/5 and V.42 bis data compression to provide total high speed throughput. It features automatic line speed correction, synchronous/asynchronous communication and automatic feature negotiaton with connecting with other modems.

**Everex** 2400B Int Modem.....69

**Hayes**
- JT FAX 4800B Internal .....139
- Personal Modem 2400 w/Prodigy .....119
- Pocket Edition 2400 Modem.....119

**Intel**
- Classic 2400 Modem Int./ Ext.....139/169
- Satisfaxtion Classic - Intl 9600.....379

### OmniLink Laser $379

Don't settle for curled-up thermal paper or tie up your PC to receive faxes - get OmniLink Laser. It connects to your phone line and HP compatible laser and receives and prints your faxes. You can still print anytime you want and OmniLink will store up to 30 faxes while your printing. Plus, its a standard 2400/9600 modem/sendfax and software is only $89.

**Practical Peripherals**
- 2400B Int Modem.....125
- 2400B Int with MNP .....159
- PM9600SA Ext. V.32/V.42bis.....449

**USRobotics**
- 2400 Sportster Int / Ext. .....119 /135
- 2400 Sportster MNP Int / Ext.....159 /189
- Courier HST 14,400 Int. / Ext. ...539 /579
- Courier HST 14,400 Dual Std Ext. ....839

**ZOOM**
- HC2400 Internal.....69
- 2400 V.42bis External Modem .....159
- 9624 Send/Receive Int Fax Modem..119

## MICE & INPUT

**Key Tronic** 101 Keyboard.....59
- Professional Mouse.....59

**Logitech**
- Mouseman Serial righthand.....59
- Mouseman Serial with Windows.....127
- Mouseman Bus righthand.....76
- Mouseman Cordless.....129
- ScanMan 32.....159
- ScanMan 32 with Catchword.....199
- ScanMan 256 for Windows.....279
- Trackman Serial .....75

### Microsoft Mouse $83

Ergonomic design and 400 DPI accuracy make this the world's most popular mouse. Microsoft design and mouse utilities assure compatibility with the programs you use most.

**Microsoft**
- Serial or Bus Mouse only.....83
- Serial or Bus with paint .....95
- Serial with Windows.....147

**Z-Nix** Super Mouse II w/Windows.....79

*International orders welcome Fax 602-437-8622*

## NETWORKING

**Artisoft/Lantastic**
- Lantastic Two Station Starter Kit:
- 2 Mbps.....349
- Ehternet.....469
- Ethernet Additional Stations .....209

**Novell**
- Netware Lite .....Call

## BOARDS & CHIPS

**Brown Wagh**
- Sound Blaster.....109
- Sound Blaster Pro (stereo & MIDI)....189

**Everex**
- RAM3000 16 bit - w/ 0K (max 3mb) ....75
- RAM3000 16 bit - w/ 1mb .....135
- RAM8000 16 bit - w/ 0K (max 8 mb) .169
- RAM8000 16 bit - w/ 2mb .....289

**Intel**
- 287XL .....85
- 387-DX25 or 33.....209
- 387-SX16 / 20.....129 /139

**Memory** - 1mb SIMMS 80ns.....$59

**Memory** - 1mb chips 80ns set of 9 .....$59

## FASTDATA PRODUCTS

### FastData 16 Bit VGA $69 (256K vers) $89 (512K vers.)

The FastData 16 bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money-back guarantee.

- FastData 16bit 1mb VGA .....99
- FastData CGA Card .....35
- FastData MGP Card.....29

### FastData Monitors

Your best value, guaranteed! We have a full line manufactured for us by manufacturers like Hyundai and Matsushita (Panasonic). As with all FastData branded product, you get a full 30-day money back satisfaction guarantee. Shown is the VGA color.

- 9600B SendFax w/ 2400B Modem .....99
- 9600B Send/Receive Fax w/2400B .....119
- Ethernet 16bit 10Base-T .....129
- IDE 16 Bit 1:1 Hard/Floppy Disk Cont....29
- IDE HD/FD w/Par/2 Serial/Game.....39
- Parallel/2 Serial/Game Card.....29
- RLL 16bit 1:1 Hard/Floppy Disk Cont. ...59
- XT 1.44 Dual Floppy Controller.....35

### FastData 2400 Baud Modem $59

The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with communications software.

**FastData Monitors**
- 14" Amber or White Monochrome.....99
- 14" White VGA Monochrome .....119
- 14" CGA Color .52 dot pitch .....199
- 14" VGA Color .31 dot pitch .....279
- 14" Super VGA 1024 x 768i .28 dp. ....319
- 14" Non-Int VGA 1024 x 768 .28 dp....429

## VIDEO & MONTORS

**ATI**
- VGA Basic 16 / Integra .....75 /129
- VGA Wonder + 256K / 512K .....159 /189
- VGA Wonder XL 256K / 1mb ....189 /259
- 8514 Ultra 8514+VGA 1mb .....599

**Diamond**
- SpeedStar Plus HiColor 1mb.....189

**Everex** EGA 480 Card.....69

**FastData** Monitors & Cards.....see above

**Hercules** Graphic Card +.....Call

**MAG** Colorview/15.....Call

**Mitsubishi**
- 1410 EGA.....325
- Diamond Scan 1381 .....499
- Diamond Scan 16L .....919

**NEC**
- Multisync GS 2a.....199
- Multisync 3FGX.....Call
- Multisync 4FG .....Call

**Orchid** ProDesigner II 1mb.....279

**Paradise**
- Basic VGA - 8 bit.....99
- VGA 1024 256K/512K.....149 /179

**Panasonic** C1381 VGA .....369

**Seiko**
- CM1440 .....499
- CM1450 .....639

**Sony** 1304 Multiscan.....629

**Video 7**
- VGA 1024i 256K / 512K .....129 /149
- V-RAM II VGA 512K / 1mb.....249 /319

**Zenith** 1492.....599

### Sound Blaster $149

Sound Blaster does for sound what VGA does for graphics! Supported by the largest software library, Sound Blaster make your games come to life. Also includes a music synthesizer, voice input and sound compression, and MIDI interface. SB Talker even converts text into spoken English. Includes a game port also.

## PRINTERS

**Canon**
- BJ10XE Portable.....319
- BJ300 / BJ330 Ink Jet.....459 / 599
- LBP-4 Laser .....799

**Citizen**
- 200GX 9 Pin.....159
- GSX-130 24 Pin .....249
- GSX140+ 24 Pin .....295
- GSX145 24 Pin Wide.....395
- PN48 Std / Pro .....299 / 329

**Fujitsu** DL3400.....359

**NEC**
- P3200 24 Pin.....269
- P3300 24 Pin Wide .....369
- P6200 / 6300.....469 / 629
- Silentwriter 2 Model 90 .....1550

**Okidata**
- Okilaser 400 .....669

**Panasonic**
- KXP1180 9 Pin.....155
- KXP1123 24 Pin.....239
- KXP1124i 24 Pin.....289
- KXP1624 24 Pin Wide .....369
- KXP2624 24 Pin Quiet.....459
- KXP4420 Laser.....699
- KXP4450i / 4455 Lasers.....Call

**Seiko** Smart Label Printer Plus.....167

**Star**
- NX1001 .....149
- NX2410 / 2415.....239 / 369
- XB2410 / 2415 .....419 / 539

### Texas Instruments MicroLaser PS17 $1199

PostScript laser printing has never been so affordable. The TI PS17 includes 1.5mb of memory, PostScript by Adobe, and 17 standard fonts including Times, Helvetica, Courier and Symbol. It handles paper up to 8.5 x 14 and envelopes too!

**Texas Instruments**
- Microlaser PS17.....1199
- Microlaser PS35.....1499

## FastData 286/12 $699

*Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Key Tronic keyboard. And since its a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!*

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms IDE hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive (2nd drive add $59)
- ✓ Standard chassis (shown)
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Math coprocessor socket
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, game port, & 2 serial ports
- ✓ Key Tronic enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available
- ✓ MS-DOS 5.0.
- ✓ Full documentation
- ✓ FCC Class B approved

| 286/12 | 40mb | 80mb | 100mb | 200mb |
|---|---|---|---|---|
| Mono | $699 | $829 | $899 | $1,149 |
| Mono VGA | $799 | $929 | $999 | $1,249 |
| VGA Color | $949 | $1,079 | $1,149 | $1,399 |
| VGA 1024i | $999 | $1,129 | $1,199 | $1,449 |

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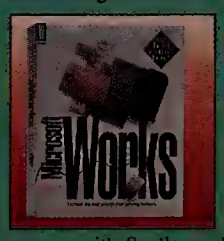

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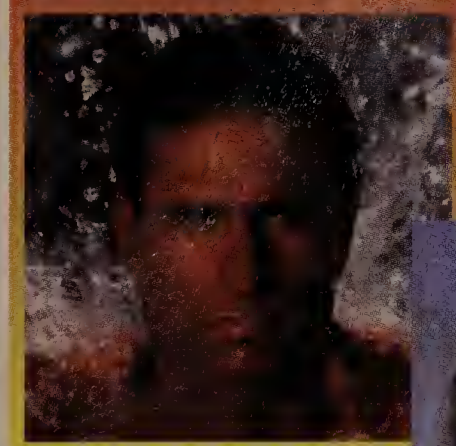

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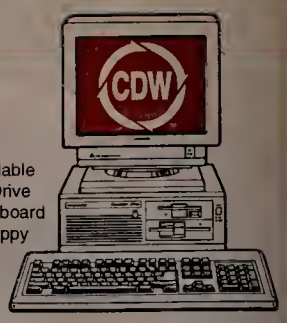

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**Complete Font Library** cart. for HP LJ III & IIID ..... 258
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**OmniPage 386 Professional** by Caere (trainable) ..... 639
**ReadRight for Windows / ReadRight** v2.01-DOS .... 314/299

*Scanner Software for Image Manipulation & Editing*
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**Gray F/X** by Xerox-Datacopy (DOS application) ..... 295
**IMAGE-IN COLOR** (works with WACOM tablets) ..... 695
**PhotoStyler** by Aldus (U-Lead) ..... CALL
**Picture Publisher Plus** by Astral/Micrografx ..... 469
**Publisher's Paintbrush** for Windows by Z-Soft ..... 285
**Tempra Pro** by Mathematica (DOS application 24-bit) .... 345
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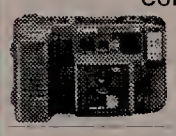

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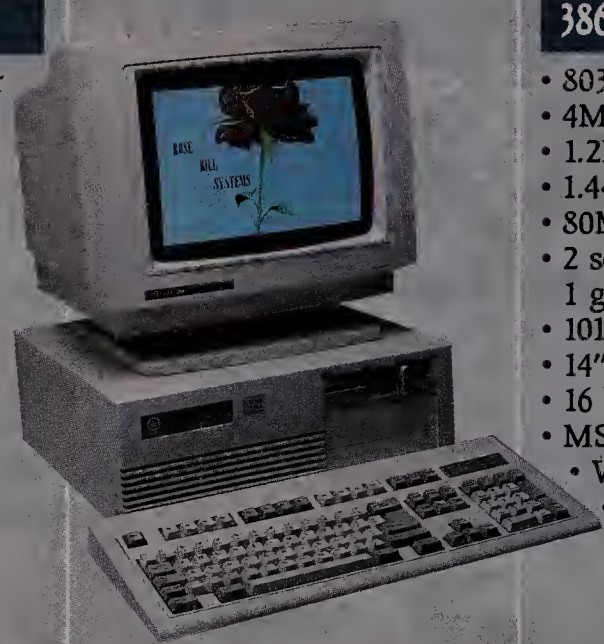


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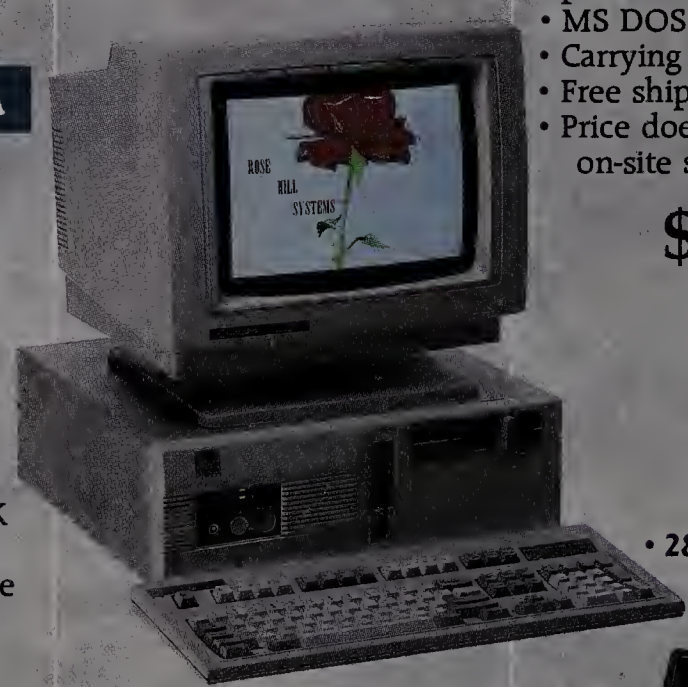


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- 1.44MB floppy drive
- 120MB IDE hard drive
- 2 serial, 1 parallel & 1 game ports
- 101 key keyboard
- 14" VGA monitor 1024NI
- 16 bit VGA adapter with 1MB
- MS DOS 5.0
- MS Windows 3.0 with mouse
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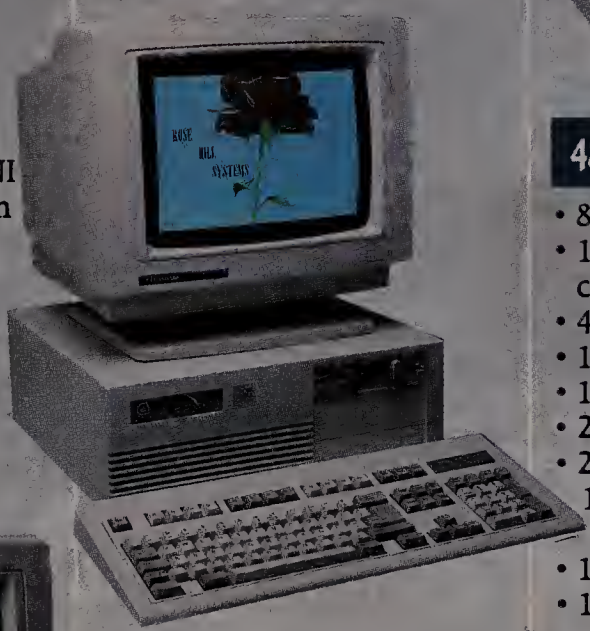

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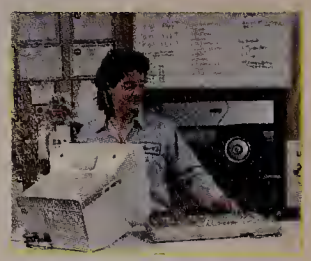

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# THE HOME OFFICE

The practical guide to home/office computing

*Steve Bass*

It's getting easier to shop for a home computer—browse just about any discount store, and you can find computers between the refrigerators and microwave ovens. Whether it's an electronics store, membership club, or warehouse outlet, they all have figured that the time is ripe to knock over my old standby, the computer specialty retailer. And judging by the brand names and the low prices, they just may succeed.

In the past when friends asked about buying a computer, I'd listen to their requirements and budget limits, give them a shopping list, and direct them to a local computer store. And that's where I'd go myself. I like the small retailers because I can rely on them for quality components and good support.

Over the years I've developed a couple of simple guidelines for selecting a merchant. The first is the *5/15* rule: The retailer has to have been in business for at least five years, and be within 15 miles of where the computer is installed. I figure that if a store has survived that long, it'll probably be around for another five years; and if the computer goes down, I can get it back to the store pretty easily. I also want to form a relationship with the staff so I can ask those inevitable "quick" questions.

Next comes the *substitution* rule, which says I must be able to swap components easily when I put a custom system together. For example, if one machine needs to run *Windows,* I can have it configured with a bigger Hardcard or a larger monitor, say a 17-inch ViewSonic. The store also has to carry top-name brands as well as no-name house brands. This way, I get to choose an inexpensive generic model for a workstation and stay with an IBM or AST for the file server.

But the corner computer store may be in trouble. America's computer buying habits are changing, and it's because users are more computer literate.

ADAM MCCAULEY

They've joined user groups, read magazines, and done their homework, and they need lots less hand-holding by the merchant—at least before the sale. The questions friends ask me have changed from a modest "What computer should I get?" to sophisticated queries about comparative disk transfer rates, dot pitch, and CPU megahertz—*and* they want store recommendations.

To the chagrin of small retailers—not to mention the Businessland and ComputerLand franchises—mass merchandisers seem to have the answers for the economy-minded home computer buyers, offering bargain-priced but high-end ASTs, Dells, and Acers.

Circuit City, for example, sells AST's Advantage—20-MHz 386SX, 80MB IDE hard drive, two floppy drives, integrated super-VGA controller and super-VGA monitor, 2MB RAM, mouse, and keyboard—for about $2250. A faster 20-MHz 486SX with more memory, larger hard disk, and built-in fax-modem, costs $400 more. It includes a one-year on-site warranty and a toll-free support line. Astonishing.

At a recent Pasadena IBM Users Group meeting, a straw poll of 350 attendees yielded surprising results: 30 people had bought at a mass merchandiser, and another 80 said they were planning to do the same.

But don't expect support or answers to your technical questions from discounters. Instead, do your research ahead of time. Make a spreadsheet of the features you want and what you'll settle for—by brand, model, and store. Then assign a precise value to each variable. If you're concerned about the quality of the system's innards, call the manufacturer and ask about the components used. Remember, you needn't take what's on the shelf. Most mass merchandisers offer special-order options, so you can get the same flexibility as at the mom-and-pop shop.

If you're in the market for a new home computer and don't need a lot of hand-holding, push your shopping cart past the garden hoses and hair curlers to find yourself a bargain.

*Contributing Editor Steve Bass is a family therapist and president of Pasadena IBM Users Group.*

ANTHONY RUSSO

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   ☐ i386™SX-based systems ☐ UNIX® based systems
   ☐ i386-based systems ☐ Laptops/Notebooks
   ☐ i486™SX-based systems ☐ Other: _____
2. Are you interested in computer products for:
   ☐ Home ☐ Business ☐ Resale
3. If for resale, please identify your primary customers:
   ☐ General Business ☐ Government ☐ Education ☐ Medical
4. How many PCs does your company plan to purchase in the next twelve months?

| Quantity | Timeframe | Quantity | Timeframe |
|---|---|---|---|
| _____ | Less than 1 month | _____ | 6-12 months |
| _____ | 1-3 months | _____ | More than 12 months |
| _____ | 3-6 months | | |

5. What do you plan to use computer products for?

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6. How many PCs do you have installed now at your company?

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   ☐ i386™SX-based systems ☐ UNIX® based systems
   ☐ i386-based systems ☐ Laptops/Notebooks
   ☐ i486™SX-based systems ☐ Other: _____
2. Are you interested in computer products for:
   ☐ Home ☐ Business ☐ Resale
3. If for resale, please identify your primary customers:
   ☐ General Business ☐ Government ☐ Education ☐ Medical
4. How many PCs does your company plan to purchase in the next twelve months?

| Quantity | Timeframe | Quantity | Timeframe |
|---|---|---|---|
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# NOW YOU DON'T HAVE TO BE RICH TO BE POWERFUL.

If you're power hungry, Dell has an i486™ screamer for just $2,999 that's sure to satisfy. Because not only does this Dell® 433P pack a punch, it's also backed by the company that's known for doing things right. And at Dell, that means doing business directly with you.

Say you want to order a Dell, or ask a few questions. Easy. Just call us and you'll be in touch with the people who not only sell Dell computers, but design and provide award-winning support for them too. Not some detached middle man with middle man hype and a markup to match. But a person who really knows his stuff. In fact, customer feedback goes right to our R&D department where they use it to develop industry-leading computers. Year after year.

With a gung-ho attitude like that, it's no wonder we became a $500+ million international company in just 7 years. Or that we'll be around to keep doing business for a long time to come.

So give us a call to order the Dell System® 433P today. We've got everything it takes to give power to the people.

## TECH STUFF

*Small footprint and a new, lower price — $2,999 or Lease for $112/month** — i486 microprocessor running at 33 MHz — Price includes VGA Color Plus monitor, 2 MB RAM, 80 MB hard drive and free factory installation of select MS-DOS® applications — 100, 200 or 320 MB hard drive configurations available*

## SERVICE AND SUPPORT

*Toll-free technical support telephone hotline for the life of your system — One full year of on-site service included in the system price△ — Self-diagnostic software — 24-hour toll-free TechFax℠ line for instant access to Dell technical information — On-line Bulletin Board to communicate with Dell technical staff and other Dell users*

## COMPANY AWARDS

*Dell has: ★ Won PC Week's Corporate Satisfaction Poll an unprecedented 8 times ★ Been ranked "Best Personal Computer in Customer Satisfaction in Small to Medium Sized Businesses" by J.D. Power and Associates† ★ Won PC World's 1991 World Class Award for Best Service & Support/Hardware*

PC WORLD WORLD CLASS AWARD — J.D. POWER AND ASSOCIATES — PC WEEK

## THE NUMBER

# 800-388-8542

*Please reference #11D48.*

*To order, please call. In Canada 800-668-3021 In Mexico 95-800-010-0664. Hours: 7 am - 9 pm CT M - F 8 am - 4 pm CT Sat. 10 am - 3 pm CT Sun.*

DELL COMPUTER CORPORATION

All prices and specifications are subject to change without notice. **Payment based on 36 month, open-end lease. Leasing arranged by Leasing Group, Inc. In Canada and Mexico, configurations and prices may vary. Dell and Dell Systems are registered trademarks and TechFax is a service mark of Dell Computer Corporation. †1991 J.D. Power and Associates' Computer End User Satisfaction Study. Phase I: Office Based Small to Medium Sized Businesses℠ Responses from Business End User at 1,784 business sites. Small to Medium Sized Businesses were based on office sites with between 1 and 499 employees. Best Personal Computer in Office Based End User Satisfaction in Small to Medium Sized Businesses. J.D. Power and Associates is a service mark of J.D. Power and Associates. i486 and the Intel Inside Logo are trademarks of Intel Corporation. MS-DOS is a registered trademark of Microsoft Corporation. Dell disclaims proprietary interest in the marks and names of others. △Service provided by third party servicer. On-site service may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price.

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Lease◊: $354/month.**

The Dell System® 450SE.* Upgradeable i486™ microprocessor running at 50 MHz. – 320 MB UltraScan™ 14C System – $9,799 – Price listed includes 4 MB of RAM*. 100, 200, 330 and 650 MB hard drive configurations also available. 33 MHz upgradeable systems also available starting at $6,599 and 20 MHz i486SX upgradeable systems also available starting at $5,299.

Lease: $134/month.**

The Dell System 420DE.* Upgradeable i486SX microprocessor running at 20 MHz. – 100 MB UltraScan 14C System – $3,699 – Price listed includes 4 MB of RAM*. 80, 200, 320, 330 and 650 MB hard drive configurations also available. Upgradeable i486 systems also available; 33 MHz starting at $4,499 and 50 MHz systems starting at $6,499.

Lease: $127/month.**

The Dell System 333D.* i386 microprocessor running at 33 MHz. – 80 MB Super VGA (1024x768) Color System – $3,399 – Price listed includes 2 MB of RAM.* 50, 100, 200, 320, 330 and 650 MB hard drive configurations also available. 25 MHz systems also available starting at $2,599.

PC MAGAZINE EDITORS' CHOICE 1-15-91

Lease: $64/month.**

The Dell System 320SX.* i386 microprocessor running at 20 MHz. – 40 MB V Color System – $1699 – Price listed includes 2 of RAM.* 50, 80, 100, 200 and 320 MB drive configurations also available.

# IF YOU ALREADY BOUGHT AN EXPENSIVE COMPUTER, BURN THIS BEFORE YOUR BOSS READS IT.

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*Performance Enhancements: Within the first megabyte of memory, 384 KB (450SE, 433SE, 420SE, 450DE, 433DE and 420DE), 128 KB (320SX, 316SX and 320LT) and 96 KB (486D/25, 333D and 32 lease. ◊Leasing arranged by Leasing Group, Inc. In Canada and Mexico, configurations and prices may vary. Dell and Dell System are registered trademarks, UltraScan is a trademark an Users at 1,784 business sites. Small to Medium Sized Businesses were based on office sites with between 1 and 499 employees. Best Personal Computer in Office Based End User Satisfaction Inside Logo are trademarks of Intel Corporation. MS-DOS is a registered trademark of Microsoft Corporation. Dell disclaims proprietary interest in the marks and names of others. **Service

*Lease: $60/month.***

*The Dell System 316SX.* i386SX microprocessor running at 16 MHz. – 40 MB VGA Color System – $1,599 – Price listed includes 2 MB of RAM.* 50, 80, 100, 200 and 320 MB hard drive configurations also available.

*Lease: $75/month.***

*The Dell System 320LT.* i386SX microprocessor running at 20 MHz. – 40 MB VGA LCD System – $1999 – Price listed includes 1 MB of RAM*. 120 MB hard drive configuration also available.

PC MAGAZINE EDITORS' CHOICE 3-92-91

SERVICE AND SUPPORT

*On-site desk-side service contract included in the system price the first year* On-line Bulletin Board communication with technical staff and other users Free factory installation of selected MS-DOS® software applications.

*Toll-free technical support hotline Toll-free TechFax line for 24-hour system information Self-diagnostic software*

COMPANY AWARDS

★ *Dell has won PC Week Corporate Satisfaction Polls an unprecedented 8 times* ★ *Dell ranked Best Personal Computer in Small to Medium Sized Businesses in the J.D. Power and Associates Customer Satisfaction Index* ★ *Dell has won PC World's 1991 World Class Award for Best Service and Support/Hardware.*

PC WORLD WORLD CLASS AWARD

CORPORATE PC WEEK SATISFACTION POLL

THE NUMBER

# 800-765-5785

*Please reference 11D49 when calling*

*Mon-Fri. between 7am-9pm CT, Sat 8am-4pm CT, Sun 10am-3pm CT In Canada, (800)663-3021 In Mexico, 95-800-010-0664 Shipped with a 30-day no questions asked money-back guarantee.*

Finally, computers for users who need blazing speed, but don't have money to burn. Notebooks, desktops and servers packed with features and priced significantly lower than comparable machines sold through traditional retail channels.

And all backed by Dell, the company that's built a $546 million international business by always going above and beyond the call. By putting them through tests the Marines would be proud of. And backing each one with a service and support package described as "overkill" by the editors of *PC Week*.

So if you need a computer you can fire up without getting fired, call Dell today. We promise you won't get burned.

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) of memory is reserved for use by the system to enhance performance. Can be optionally disabled on all except 320LT. All prices and specifications are subject to change without notice. **Payment based on 36-month, open-end echFax is a service mark of Dell Computer Corporation. 1991 J.D. Power and Associates' Computer End User Satisfaction Study: Phase I: Office Based Small to Medium Sized Businesses.℠ Responses from Business End mall to Medium Sized Businesses. J.D. Power and Associates is a service mark of J.D. Power and Associates. ∴Contains an Intel® i386™ or Intel i486™ microprocessor. Intel is a registered trademark and i386, i486 and the Intel ovided by third party servicer. On-site service may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price. ©1991 Dell Computer Corporation. All rights reserved.

Fasten your seat belts. Because now you can get the speed and power of an i386™ system without laying out any serious dollars. Or having to deal with a suspect company.

It's the Dell® 325P for only $1,999. This full-blown 25 MHz, i386DX system with an 80 MB hard drive offers maximum performance at the lowest possible price. So it's ideal for any mainstream business application. And it comes from Dell, a company that has built a $546 million international business in just 7 years.

When you buy from Dell, you always deal with us directly. So there's no high dealer margins or erratic support. You'll get a computer we designed, manufactured, and rigorously tested ourselves. And it comes with the service and support that helped us become one of the most awarded PC companies in the world.

So don't wait. Call us today for the Dell 325P.

Because even though the price is stripped down, the computer isn't.

# IT'S KIND OF LIKE GETTING A PORSCHE FOR THE PRICE OF A YUGO.

*Lease*. $75/MO.** –□Call now for special promotional price. Expires 12/31/91*

TECH STUFF

*System includes 80 MB Hard Drive, VGA Color Monitor, and 2 MB RAM. Upgrade options to boost performance: 32KB cache or 33 MHz i486™.*

SERVICE AND SUPPORT

*On-site desk-side service contract included in the system price the first year^ — Toll-free technical support hotline — Toll-free TechFax℠ line for 24-hour system information — On-line Bulletin Board communication with technical staff and other users — Self-diagnostic software — Free factory installation of selected MS-DOS® software applications*

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PC WORLD WORLD CLASS AWARD

CORPORATE TOP RATED PC WEEK SATISFACTION POLL

THE NUMBER

**800-825-0044**

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